ABSTRACT

Title of Document: RECONNECTING TO THE WATERFRONT: A MARITIME AQUARIUM FOR SOUTHWEST, WASHINGTON, DC
Stephen Anthony Ramos, Master of Architecture, 2006

Directed By: Associate Professor Ronit Eisenbach, School of Architecture, Planning and Preservation

This thesis re-links Washingtonians to the Potomac River waterfront, once an essential amenity for the city. Citizens of the original working-class community of Southwest, Washington, DC were drawn by the availability of maritime jobs due to its close proximity to the Washington Channel. In the 1950's, a campaign of Urban Renewal was enacted, which ultimately resulted in the gentrification of the indigenous community, altered street patterns and the removal of historic building fabric. One of the major fallacies of the development was the irresponsible development along the waterfront, which severed and limited the connection between the neighborhood and the Washington Channel.

This thesis encourages the exploration of and interaction with Washington's historic maritime culture and the exclusive ecosystem of the Chesapeake Bay watershed. The tools for working this connection are the Washington D.C. Maritime Aquarium and a new waterfront promenade. The

Maritime Aquarium which adds a major public educational venue to the city's downtown area will feature aquatic exhibits on the Chesapeake Bay watershed and interpretive exhibits on the history of Washington's maritime culture. Reclaiming and activating the lethargic waterfront, the new promenade allows visitors the opportunity to engage the water and participate in a variety of recreational activities. Ultimately this thesis educates and increases our awareness of our relationship with the natural world, while simultaneously improving the aesthetics of the existing waterfront and city.

RECONNECTING TO THE WATERFRONT:
A MARITIME AQUARIUM FOR SOUTHWEST, WASHINGTON, DC

By

Stephen Anthony Ramos

Thesis submitted to the Faculty of the Graduate School of the
University of Maryland, College Park, in partial fulfillment
of the requirements for the degree of
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2006

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Acknowledgements

This thesis would not have been possible without the support from all of my friends and family, which I am highly grateful for. I'd like to thank my committee members Ronit Eisenbach, Richard Etlin, Roger Lewis, Steve Sachs and Jack Sullivan for all of their insight and criticism through out this journey. I'd also like to thank the following people who helped with the production of my final presentation; Lin Mao, Swetha Akasapu, Brian Szymanski, Jake Zager and Abe Wilson.

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Introduction

Figure 1.0 Earth

The later half of the 20th century has witnessed a movement towards the reclamation of damaged and abused urban waterfronts. Washington, DC followed this movement with the creation of the Anacostia Waterfront Initiative. Established in 2000, the Anacostia Waterfront Initiative Framework Plan was developed to foster the transformation of the Anacostia River "from the city's forgotten river to a gem that could rival any urban waterfront in the world." Included within this plan is the Southwest Waterfront Plan, which includes the development of nearly 50 acres of waterfront along the Washington Channel.

One problem with the District's waterfront is that the beauty has been lost. A waterfront, which was once an important aspect of the L'Enfant plan, is now ugly and abused from irresponsible human behavior. The water quality of the Washington Channel and Anacostia River are poor and do not support primary human contact or fish consumption due to high pollution levels. With future waterfront development inevitable, it is important that we understand the negative circumstances that our footprint has inflicted upon Mother Nature.

. The Maritime Aquarium and new promenade will help to make a healthy urban environment an intrinsic part of everyday life. Providing a public place that enriches the public of human interaction with nature, the museum hopes to inspire people to think about the environmental consequences of their actions and motivate them to act in ways that benefit the environment. Aside from promoting river clean up and public awareness, this thesis thoroughly promotes the enjoyment of the District's waterways.

Southwest, Washington, DC
A Waterfront Neighborhood

Figure 2.00.

The site of this thesis is the Southwest neighborhood of Washington, D.C. The Southwest waterfront is located approximately half a mile south of the National Mall and bordered to the West by the Washington Channel, an inlet of the Potomac River.

Historical Background

The original plan for Washington DC by Major Pierre Charles L'Enfant displayed L'Enfant's preoccupation with the relationship between the natural and the urban. Southwest was a vital component of the L'Enfant plan that was responsible for meshing the idealized urban grid with the circumstantial natural conditions of the site. Connected to the Capital and the National Mall by several arterial streets, the Southwest waterfront included piers for waterfront commerce on the Potomac River as well as a major public square located at the intersection of 8th and K Street (fig. 2.0)

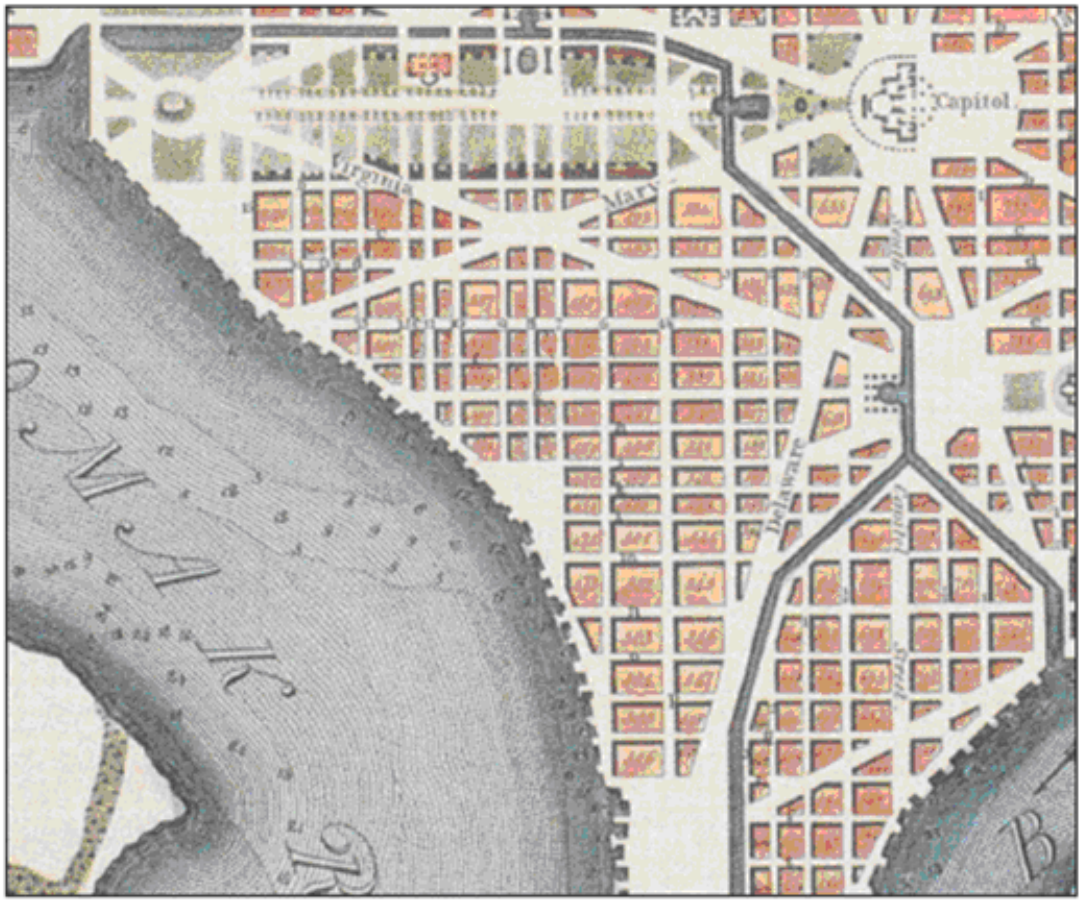


Figure 2.0.[1] The L'Enfant plan as modified by Ellicot in 1792 exhibits the abundance of fishing wharfs lining the waterfront. The plan also exhibits the optimum connection between Southwest, the National Mall and the Capitol.

The productive use of the waterfront was faltered by periodic flooding and low-lying tidal flats. In 1881 an eight-year project began to dredge a shipping channel that could become the Washington Channel. The resulting fill was used for westward expansion of the mall and the creation of Potomac Park (fig. 2.1).[2]

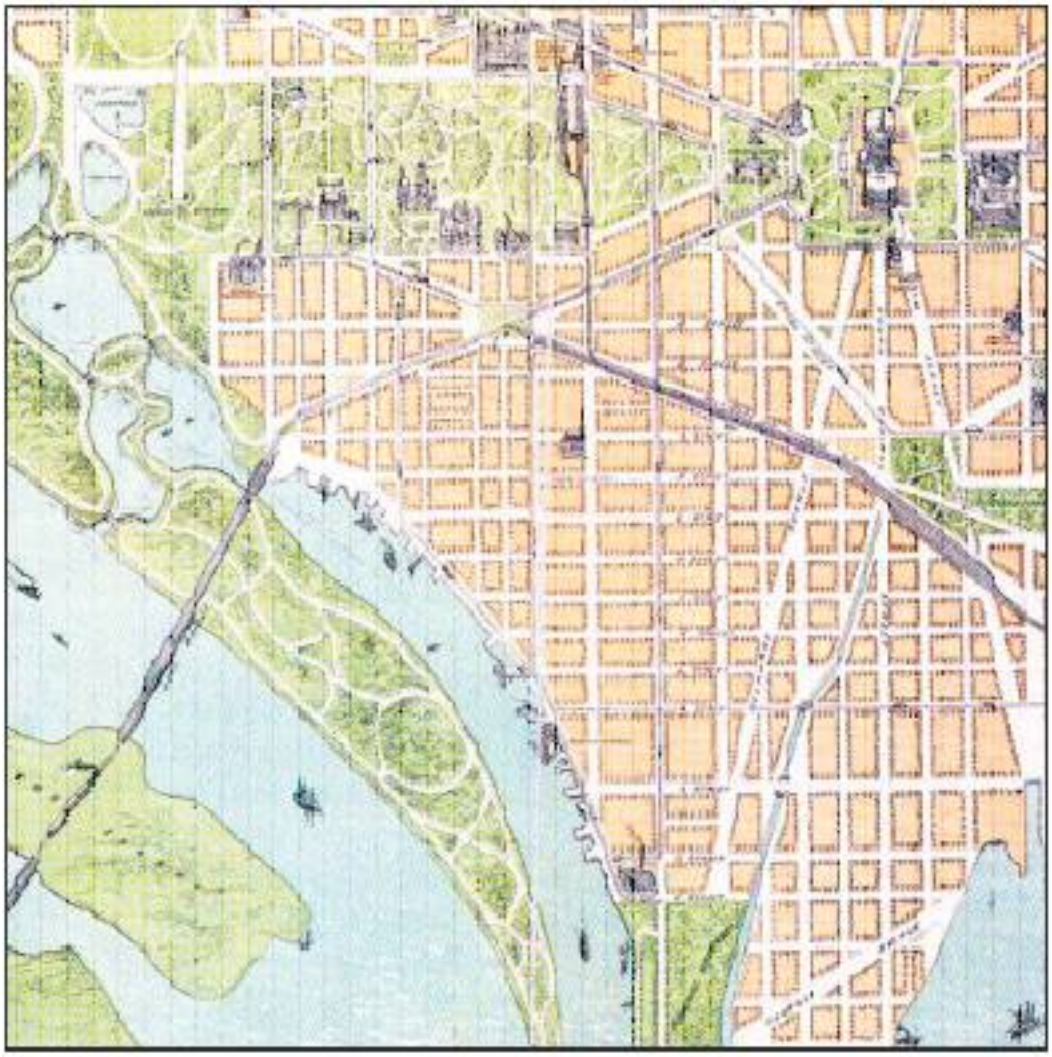


Figure 2.1.[3] The 1892 Dubois map of Washington shows the alterations made in 1881.

The tidal basin was also created in 1881, which was designed as a series of flushing basins that would supply fresh water to the Washington Channel and create ornamental landscapes adjacent to the mall. Unfortunately, the Tidal Basin does not provide the intended flushing, which has resulted in the pollution of the Washington Channel, which is in need of environmental restoration.[4]

Into the 1900's Southwest flourished as a blue collar community populated by workers in the nearby waterfront and industrial districts. The navigable shipping area

catered to a wide range of industries. The housing fabric was dominated by low-rise townhouses.

Figure 2.2. Passengers sprint off the River Queen for the Marshall Hall Amusement park around 1920. The Marshall Hall Amusement park was located on the Potomac in Charles County, just south of Mount Vernon. The boat went from the Washington waterfront to Mount Vernon, then across to Marshall Hall.

Figure 2.3. Chesapeake Bay watermen once sold their catch from their boats tied to the wharfs of Southwest.

Despite its large population and active industrial functions, Southwest was targeted as a "Principal Problem Area" in the 1950 Comprehensive Plan for the District. In 1952, a drastic plan of Urban Renewal was enacted, which demolished and redeveloped the entire Southwest quadrant. The ultimate result of the renewal was the gentrification of the indigenous community, segregated land-uses, super blocks designed for suburban-style housing complexes, severed streets and the erection of the Southeast/Southwest freeway, which split the connection of Southwest to the rest of the city

Southwest Today

Rebounding from its tumultuous history, the Southwest neighborhood has matured and developed into a strong urban community. Southwest benefits from a community that is diverse, socially, ethnically, and economically (fig.2.4). Today,

Southwest is more ethnically and racially diverse than the District as a whole. The breakdown of ethnic groups in Southwest is 55% African-American, 41% white, as well as 4% Hispanic and other ethnic groups. According to 1998 data, the median household income was $47,511, $4,500 greater than the median income for the district.[5]

Physical attributes and spatial character of Southwest Today are thoroughly documented and analyzed in the following chapter.

Site Documentation and Analysis

Figure 3. Diversity.

The proposed site for the museum is the plot of waterfront land located at the Western Terminus of M Street in Southwest, DC. Currently the site is utilized as surface parking for the Spirit of Washington and Odyssey cruise boats. The site is bounded by the Washington Channel to the West, the Channel Inn to the North, Maine Avenue to the East and more surface parking to the South. There are two parcels of land being considered for the site of the museum. For the ease of the analysis, the entire area bounding the two parcels will be analyzed. It is also important to note that I have adopted several of the proposals made under the Southwest Waterfront Plan. These principals are presented at the conclusion of this chapter.

The site for the new waterfront Promenade is the strip of waterfront bounded to the north by the fish market and Fort McNair to the South. As shown in figure 3.00, the expanse of land stretches approximately ¾ mile and will average 60 feet in width.

Figure 3.00. This hybrid site plan presents buildings conceptualized in the Southwest Waterfront Plan superimposed atop of existing waterfront buildings.

Photo Documentation

The following photos document the existing conditions of the thesis site and surrounding context. The site legend below illustrates the locations of each photograph.

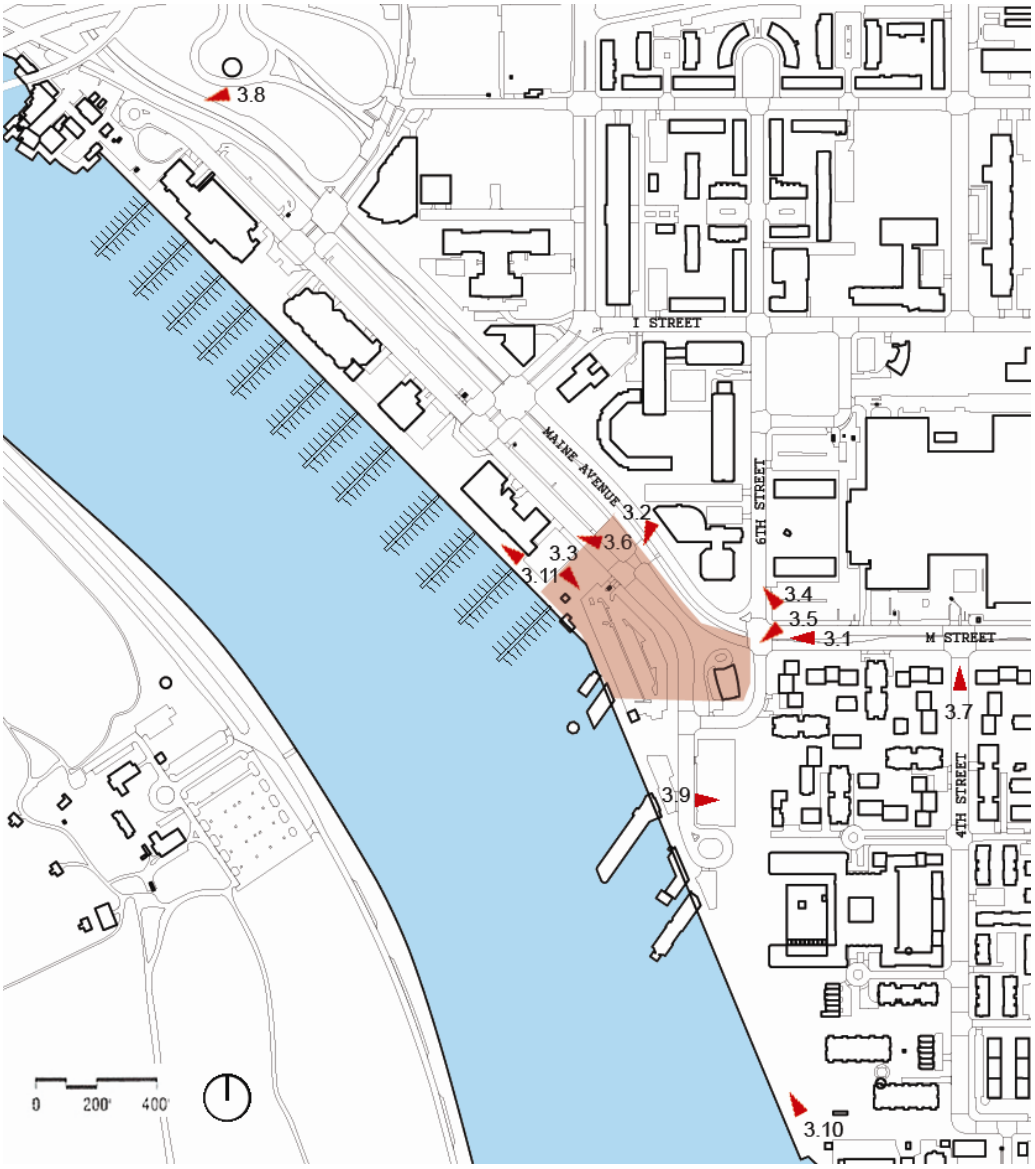


Figure 3.0. This site plan shows the locations of the following site photos.

Figure 3.1. Looking west at the intersection of M and 6th street. The thesis site is bordered to the East by St. Augustine's Episcopal Church (left) and the Arena Stage Theater (right). Unfortunately the axis of M street is not formally terminated and views to the water are obstructed. This photo also shows the superfluous size of the lightly trafficked Maine Avenue.

Figure 3.2. This photo shows the site from across Maine Avenue. Currently the site is covered by on-grade parking. The parking lot serves the cruise boats nearby.

Figure 3.3. This photo shows the site from a vantage point north of the parking lot.

Figure 3.4. The arena stage established in 1950 is arguably the most popular destination in Southwest. The Arena Stage features three individual theaters that present a mix of classic and modern productions. The theater's strong reputation coupled with its close proximity to the Maritime Aquarium makes it an adequate participant in the civic square, which will be developed in this thesis.

Figure 3.5. St. Augustine Episcopal Church is located at the intersection of M and 6th street. St. Augustine provides the community with public meeting and gathering space while also having regular church services. If the Maritime Aquarium is designed on the southern site than the decision must be made of whether to keep the church.

Figure 3.6. The Channel Inn Hotel which borders the thesis site to the North is slated for removal in the Southwest Redevelopment Plan. The Inn will also be removed for the purposes of this thesis due to its insufficient land use and poor aesthetics.

Figure 3.7. 4th street terminates at M street because of the Waterfront Mall that was superimposed over the original L'Enfant grid. The Southwest Redevelopment plan has conceptualized re-stitching 4th street through the mall site. The mall which once held a high density of Southwest's retail development is slated for demolition. It is quite ironic that a heavily introverted building is named for its nearby external amenity. The Waterfront Metro Station (green line) emerges at the center of the Waterside mall site.

Figure 3.8. The Washington D.C. Fish Market sits at the northern edge of the Southwest waterfront where barges and stalls sell fresh seafood. The fish market is isolated by the large expanse of Maine Avenue to the east and the overpass of I-395 hovering above. The very popular market features an insufficient amount of parking and a less than friendly pedestrian approach. The fish market is one of the strong amenities of Southwest, DC and it will terminate the new waterfront promenade.

Figure 3.9. To the south of the thesis site, the historic Thomas Law House is nestled within the courtyard space of the Tyber Island Apartment complex. The house now serves as a community center for residents of Tiber Island and nearby Carrollsburg Square. The apartment complex in the background is the typical residential typology in Southwest. Notice the ridiculous amount of paving that separates the complex and the waterfront.

Figure 3.10. The waterfront park south of the thesis site features an excessive amount of paving. Unfortunately it also features limited pedestrian activity.

Figure 3.11. The current waterfront promenade features a two-level design. Together the Washington Marina, Capital Yacht Club and Gangplank Marina feature slips for 500 boats. Gangpank marina has a liveaboard population of 87.[6] Liveaboard is a term used to describe a person who resides full time on a boat. Many of the liveaboards fear that new development along the waterfront will force them from the area.

Site Analysis

The following figures analyze various physical attributes of the existing neighborhood of Southwest, as well as the museum site and its immediate contest. Site changes adopted from the Southwest Waterfront Plan are included at the conclusion of this chapter.

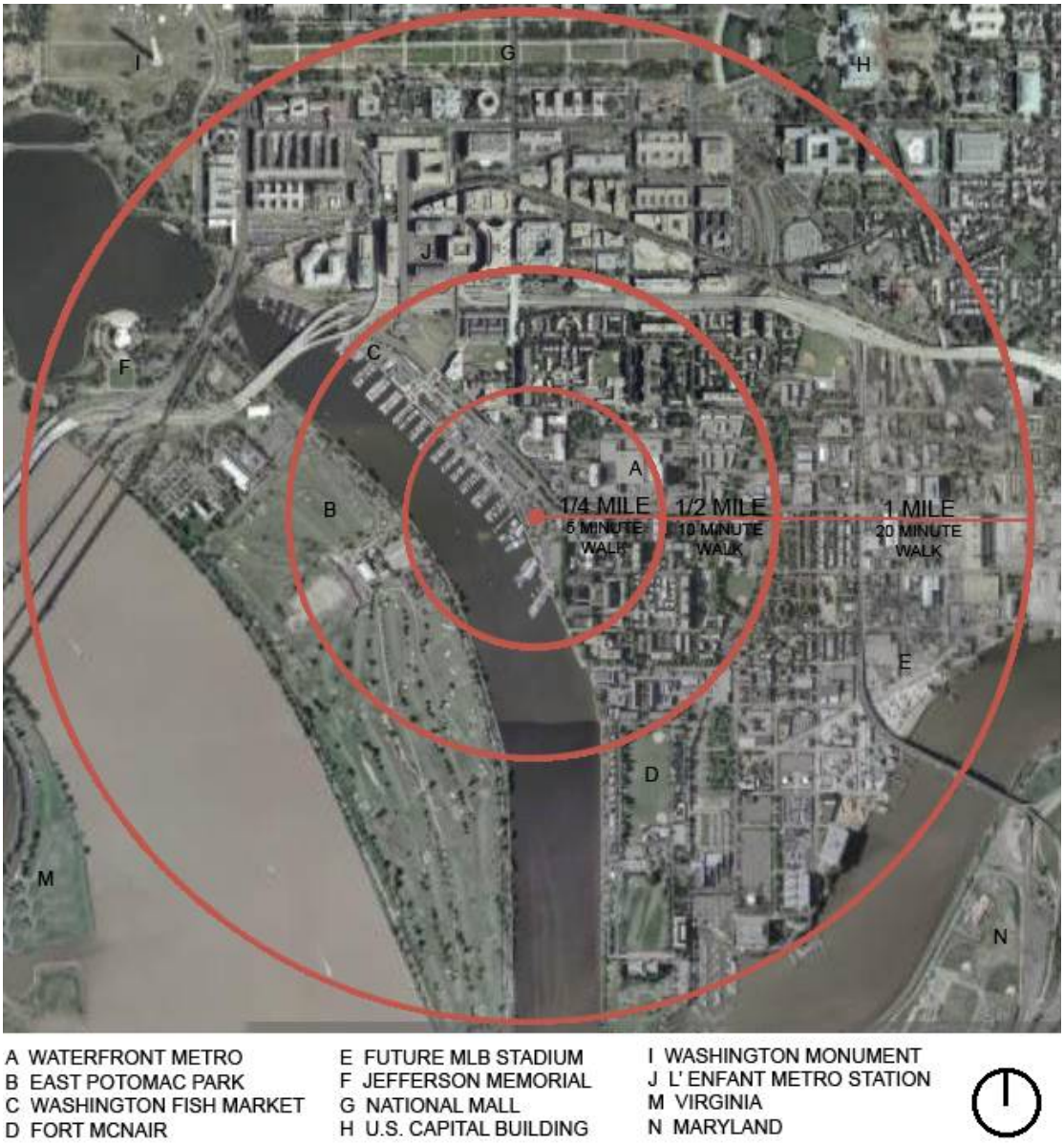


Figure 3.12 . This aerial photo shows the neighborhood of Southwest and its proximity to many major destinations. The Southwest Waterfront is conveniently located within a five minute walk from the Waterfront Metro Stop. Located within a 15 minute walk are the L'Enfant Metro Station to the north and the Navy Yard metro to the East.

Figure 3.13. The existing figure ground shows the discontinuity of the urban fabric. Notice the lack of density along the waterfront and the change in foot print size between the federal city and the residential fabric of Southwest. The anonymity of the existing street pattern is representative of the fallacies of the 1950's renewal. The existing fabric suffers from poorly defined street edges, which is extremely evident in this image.

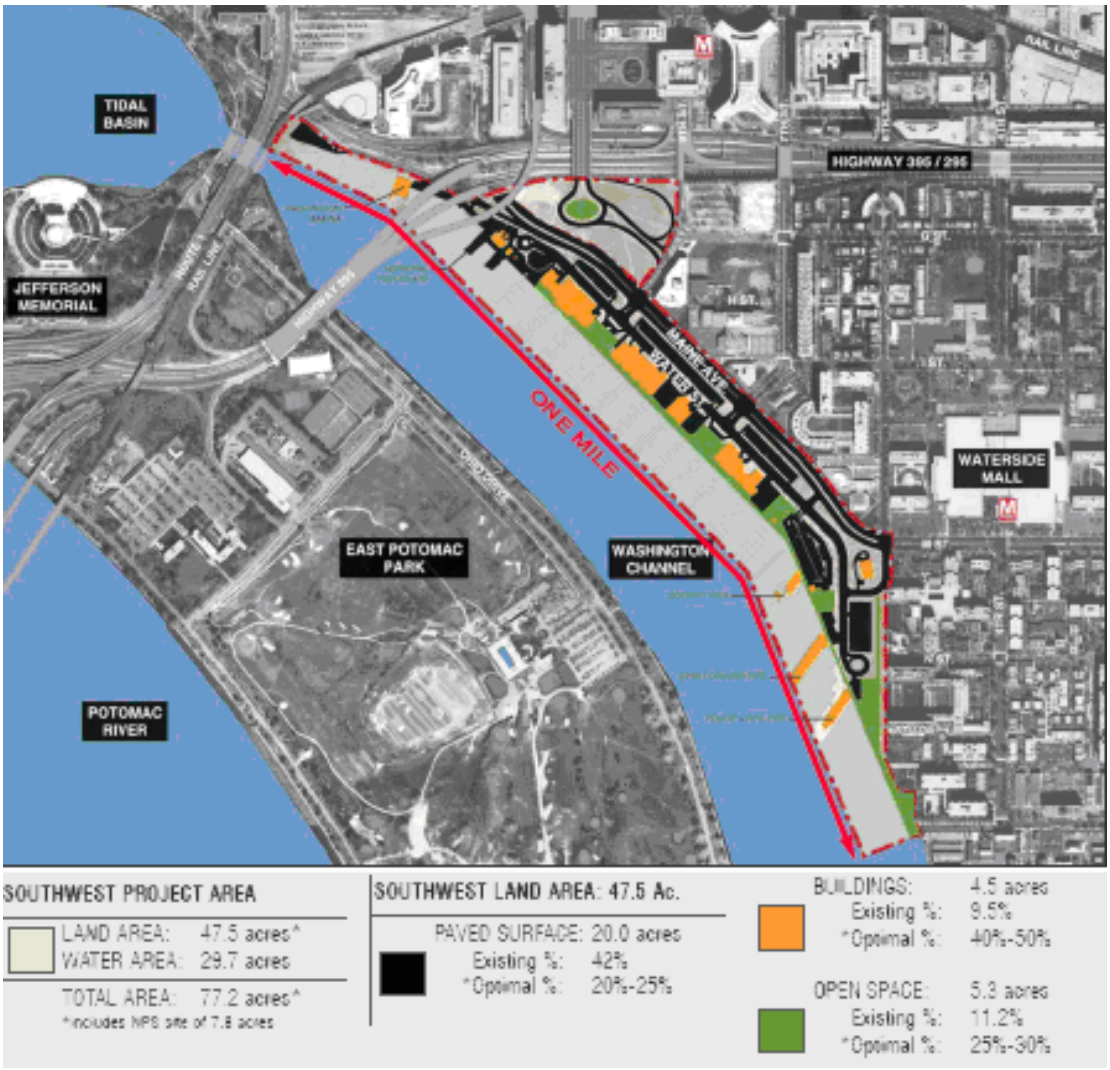


Figure 3.13.[7] The Southwest Waterfront is tremendously underutilized. The amount of space taken up by building foot prints and open space along the waterfront is less than ten acres compared to the 20 acres of paved surface.

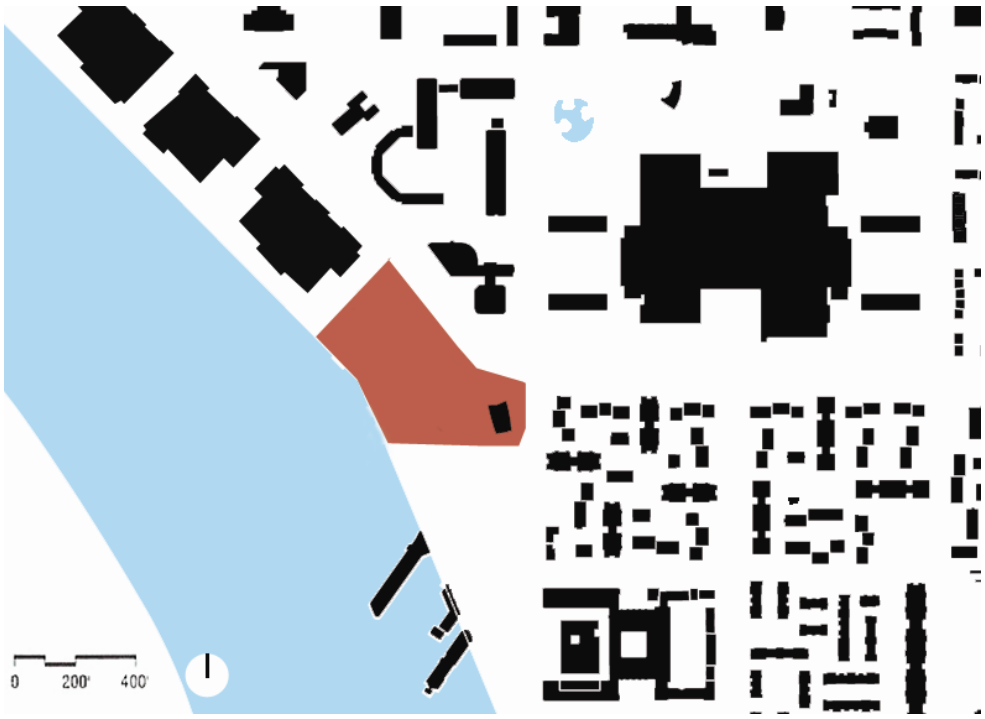


Figure 3.14. The figure ground of the immediate context illustrates the scattered fabric and poorly defined street edges..

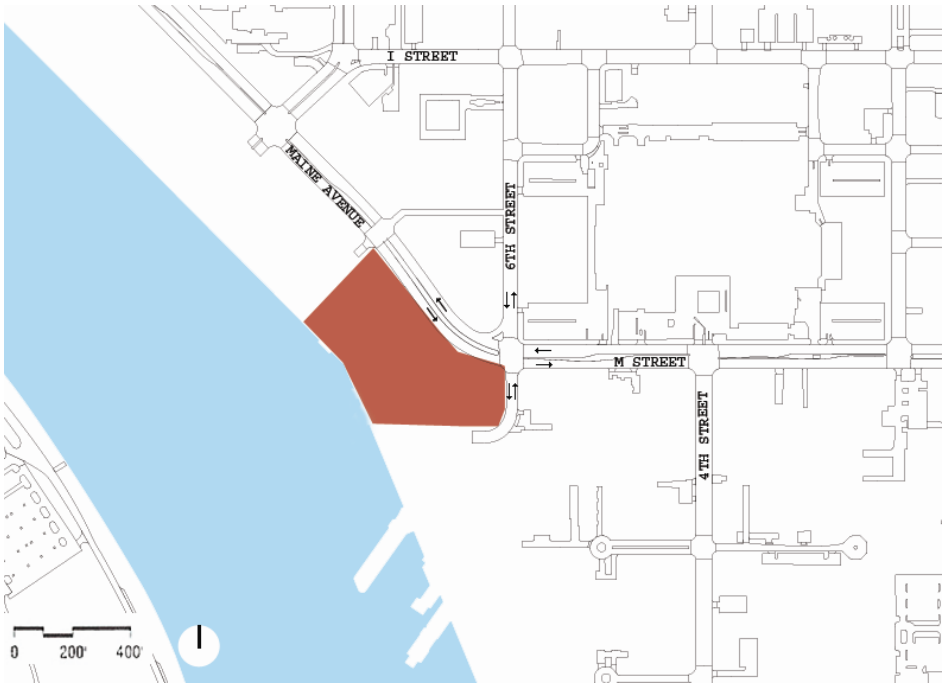


Figure 3.15. The thesis site occurs at the confluence of Maine Avenue, M Street and 6th Street. This diagram also illustrates the unfortunate street and block pattern created by the 1950's Urban Renewal. Notice how the street grid terminates into suburban cul-de-sacs before it reaches the waterfront.

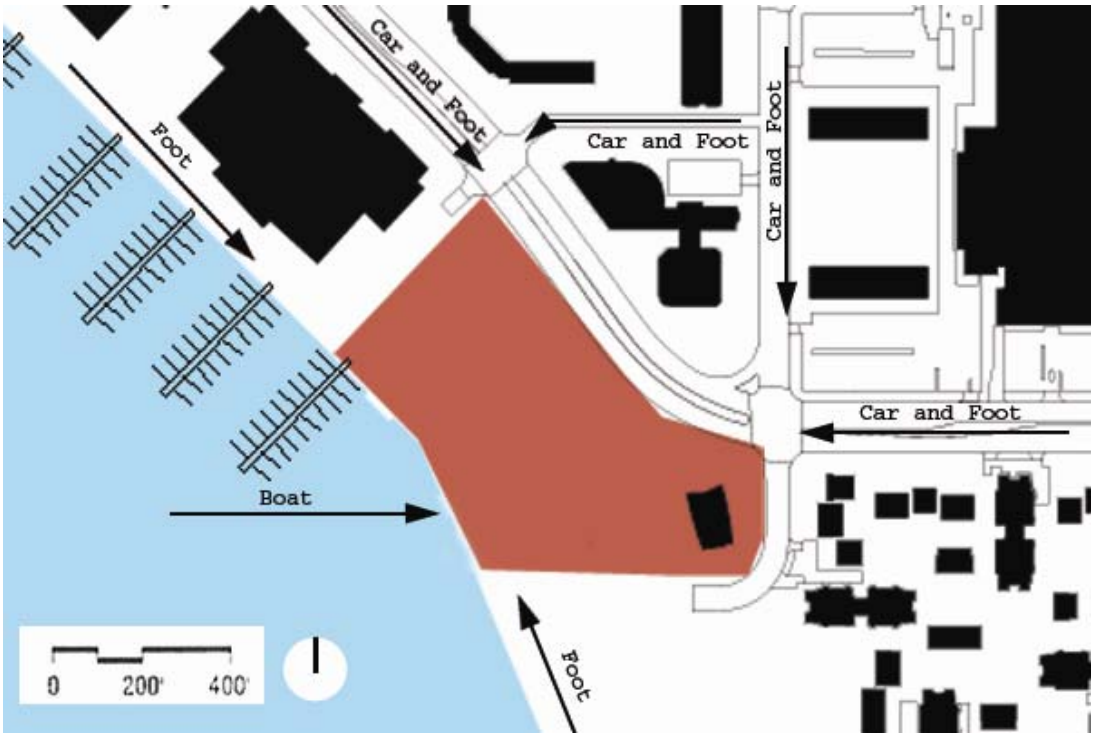


Figure 3.16. This plan shows the multiple ways that the site can be accessed. The site is conveniently located at the intersection of several main pedestrian and automotive paths. Due to the fact that the site will be accessed from all sides, the design of the service functions of the museum will require an aggressive and clever strategy.

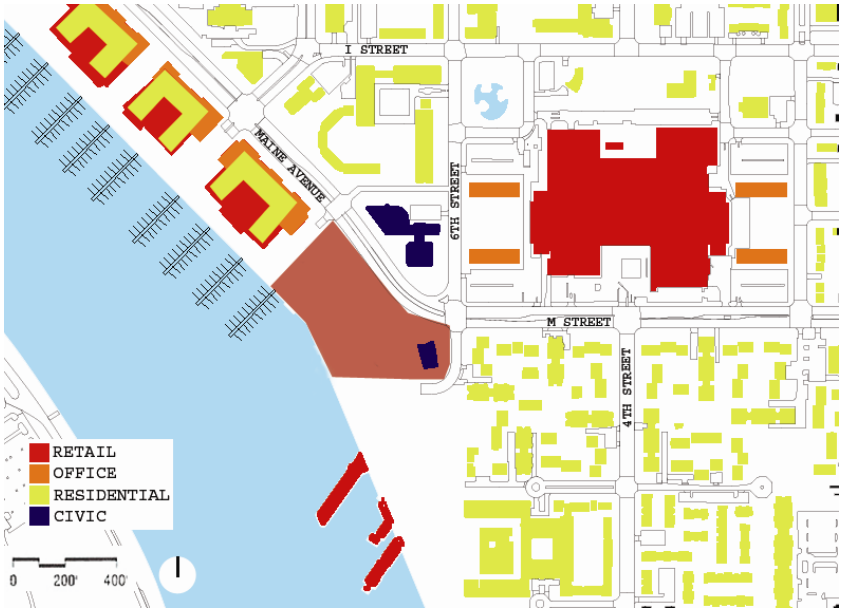


Figure 3.17. This land-use diagram features the mixed-use buildings north of the thesis site, which are proposed in the Southwest Redevelopment Plan. The existing neighborhood is dominated by residential and suffers from segregated land-use. The Waterfront Mall, which is slated for demolition, housed a majority of the neighborhood's retail.

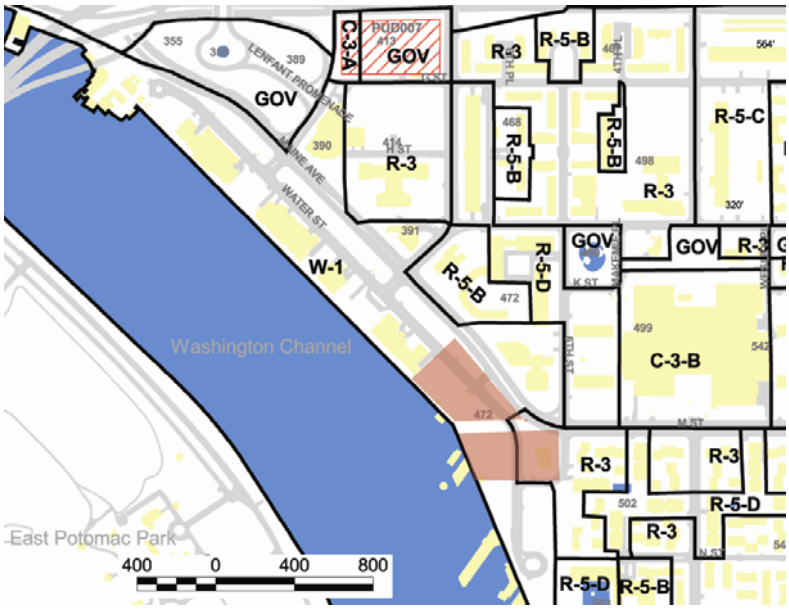


Figure 3.18.[8] Zoning Diagram. W-! permits matter-of-right low density residential, commercial, and certain light industrial development in waterfront areas to a maximum lot occupancy of 80% for residential use, a maximum height of forty feet. R-3 permits matter-of-right development of single-family residential uses (including detached, semi-detached, and row dwellings), churches and public schools with a minimum lot width of 20 feet, a minimum lot area of 2,000 square feet, a maximum lot occupancy of 60% for row dwellings, a minimum lot width of 30 feet and a minimum lot area of 3000

square feet and 40% lot occupancy for semi-detached structures, and a minimum lot width of 40 feet and a minimum lot area of 4000 square feet and 40% lot occupancy for detached structure; and a maximum height of three (3) stories/forty (40) feet. FAR of 2.5 for residential and 1.0 for other permitted uses and a maximum height of forty (40) feet.

Environmental Conditions

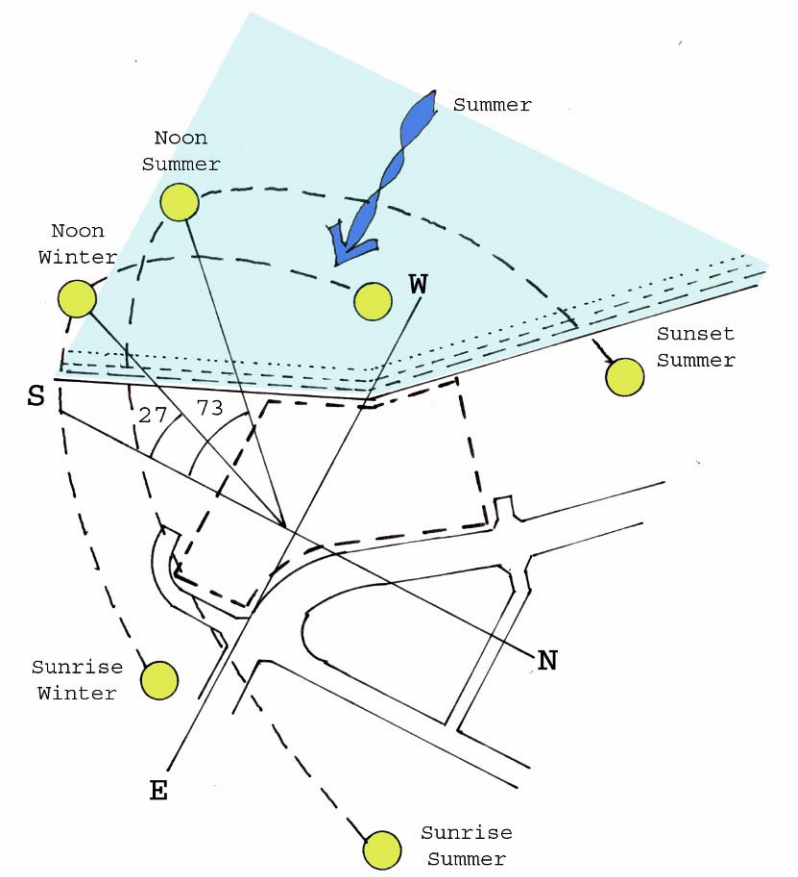


Figure 3.19. This diagram illustrates the solar and wind orientation of the site. The Southern site features an abundance of Southern light due to absence of buildings to the south.

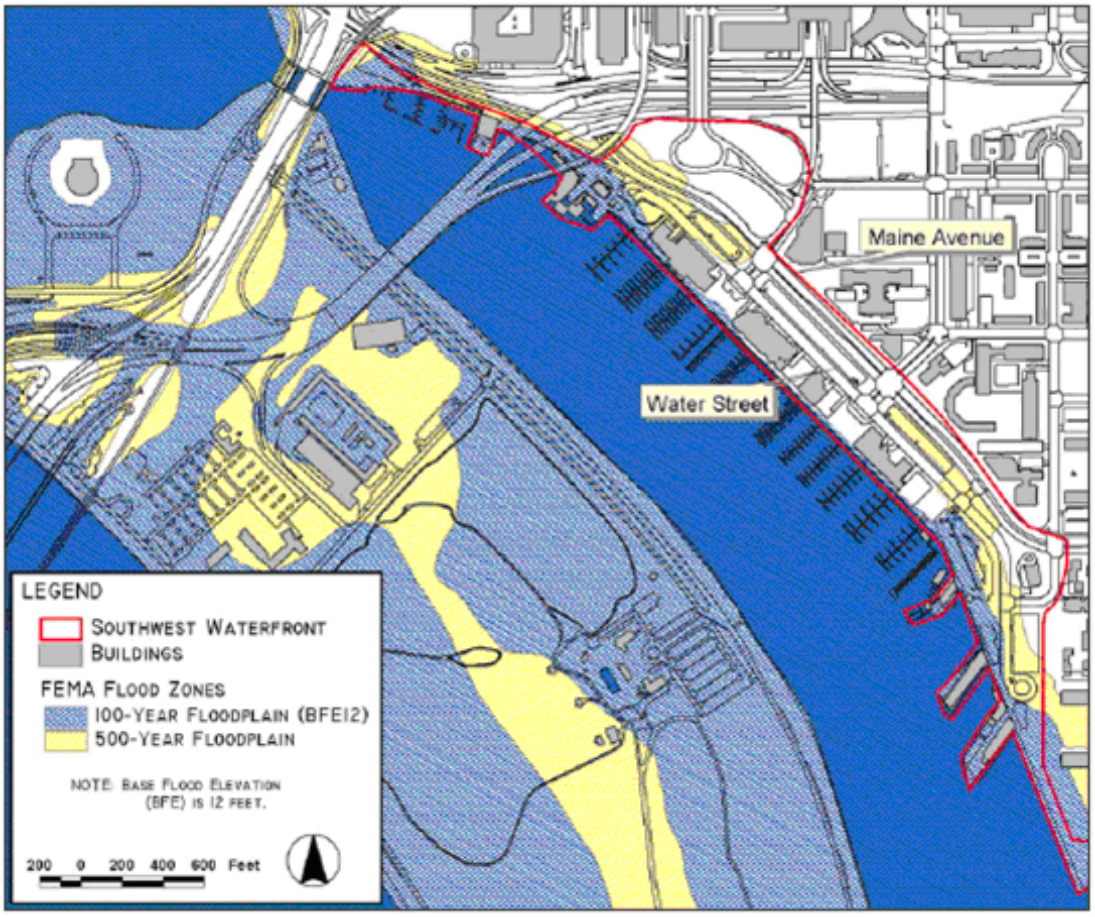


Figure 3.20.[9] The western edges of the thesis site lie within the 100 and 500 year floodplain. The entire shoreline of the project area is within the Federal Emergency Management Agency Zone. This zone within the 100-year floodplain is defined as having a base flood elevation (BFE) of 12 feet. All of the existing structures adjacent to the promenade are constructed above the 12 foot BFE and have underground parking that was designed to allow flooding. As a result of the floodplain conditions, the potential of redevelopment limitation is considered moderate. Any development within the floodplain will need to comply with the District's Flood Hazard Rules. The lowest inhabited floor of any development will need to be constructed 1.5 feet above the BFE, which is 13.5 feet. However if the lowest floor of redevelopment is non-residential and not elevated in accordance to the BFE then the structure must be designed and constructed to be completely or essentially dry in accordance with the standards contained in the publication entitled flood-proofing regulations and written by the USACE.[10]

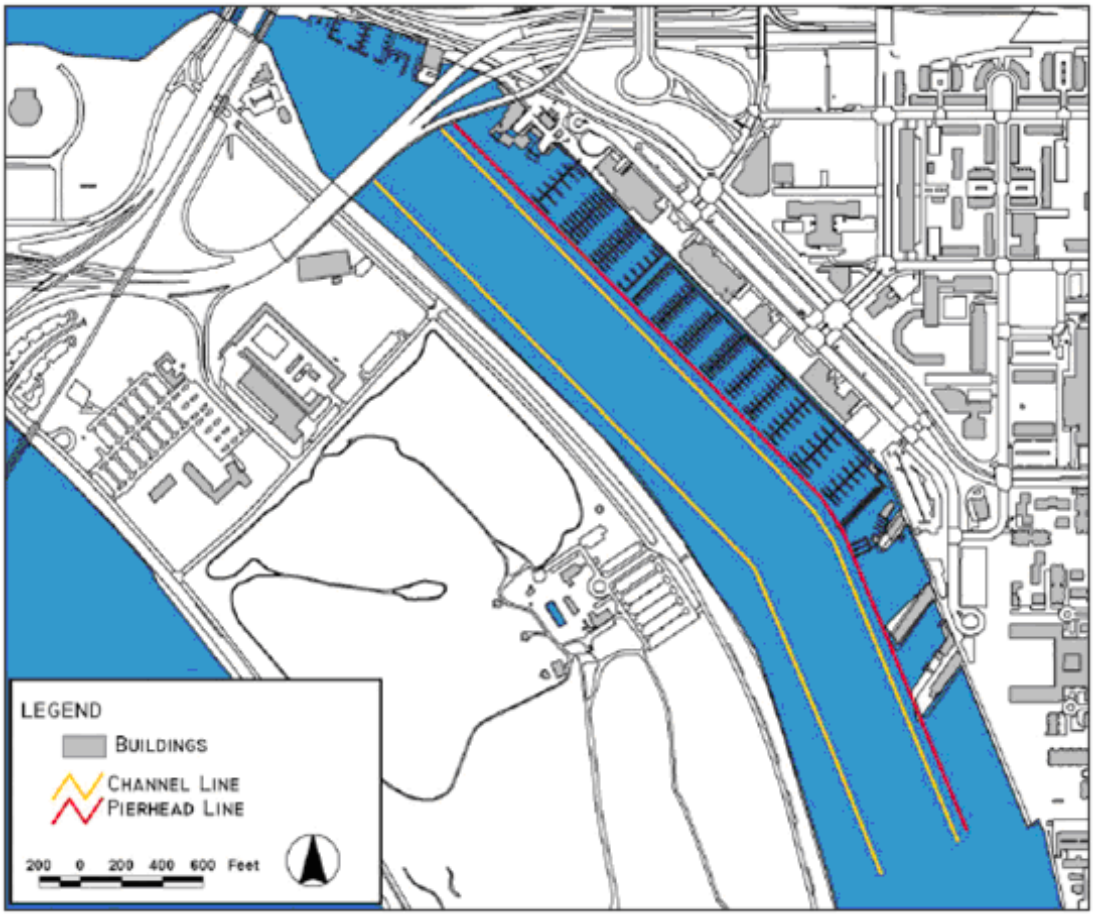


Figure 3.21.[11] The Washington Channel is approximately 9,600 feet by 850. The actual ship channel is located 50 feet from the pierhead line, which projects 272 feet from the Southwest Waterfront promenade. Channel dimensions are 24 feet deep and 400 feet wide. The Channel has an average tidal range of 2.9 feet, an irregular tidal range of 4.5 feet and an extreme tidal range of approximately 10.7 feet.[12]

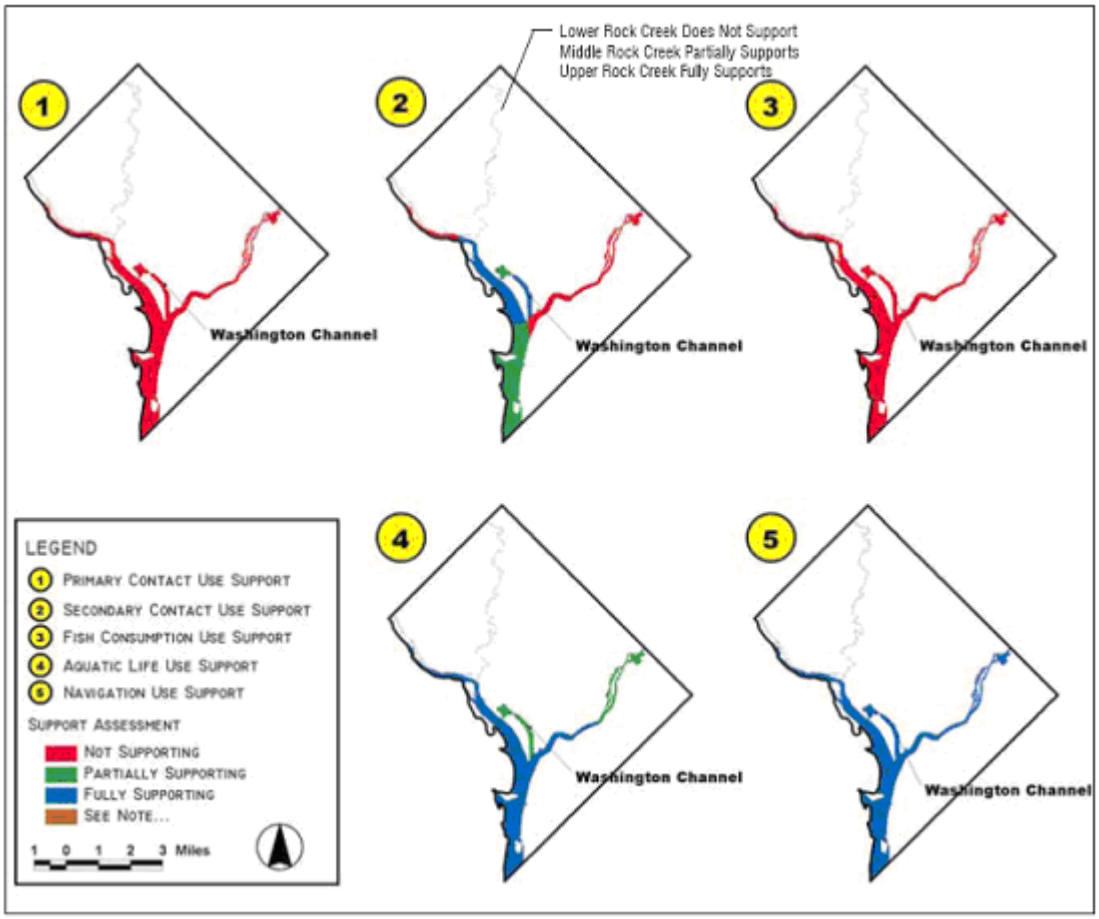


Figure 3.22.[13] This diagram displays the supporting quality of Washington's waterways.

TABLE D1
Washington Channel Use Support Status

CLASS OF WATER	CLASSIFICATION
Primary contact recreation	Not Supporting
Secondary contact recreation and aesthetic enjoyment	Fully Supporting
Protection & propagation of fish, shellfish and wildlife	Partially Supporting
Protection of human health related to consumption of fish and shellfish	Not Supporting
Navigation	Fully Supporting

Figure 3.23.[14] Figure shows the uses supported by the Washington Channel's water quality. The quality of the Washington Channel is relatively good compared to the Anacostia in general; however some uses are not supported. Storm sewers emptying into the Channel and boats moored at local marinas are suspected as sources of pollution. Primary contact recreation within the channel is not

supported due to high fecal coliform bacterial levels. Although the District Commission of Public Health advices against the consumption of catfish, carp and eel caught in any District waters many people do fish on the banks of the channel.[15]

Figure 3.24. Since there are no public docks along the waterfront the fisherman are forced to fish in areas not designed for fishing. On several occasions I've witnessed the fisherman verbally accost private boats passing by for traveling too close to shore. Therefore it is obvious that it is not an ideal situation for fishing. This seems very ironic to have a waterfront which is not susceptible to fishing.

The Southwest Waterfront Plan

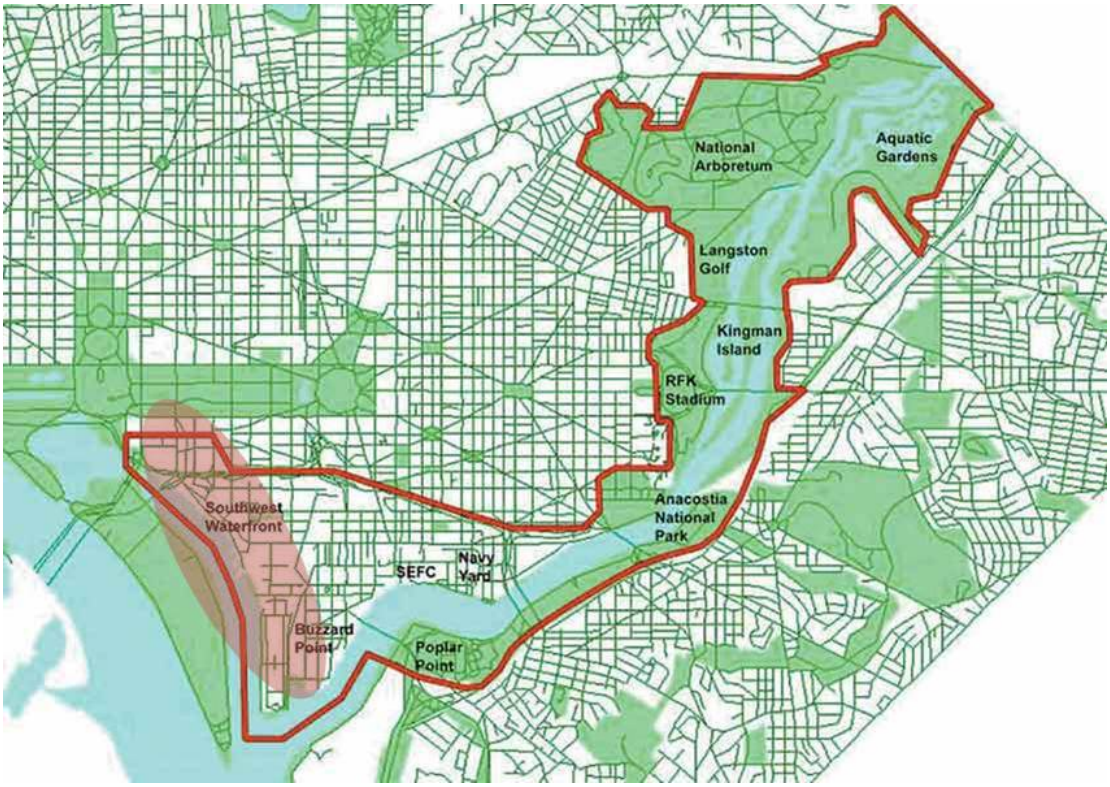


Figure 3.25. In 1999, the Southwest Waterfront was identified as one of several target areas for inclusion in the Anacostia Waterfront Initiative (AWI), a program that aims to revitalize the District's waterfront as a destination for residents of adjacent neighborhoods, the city, and the region.

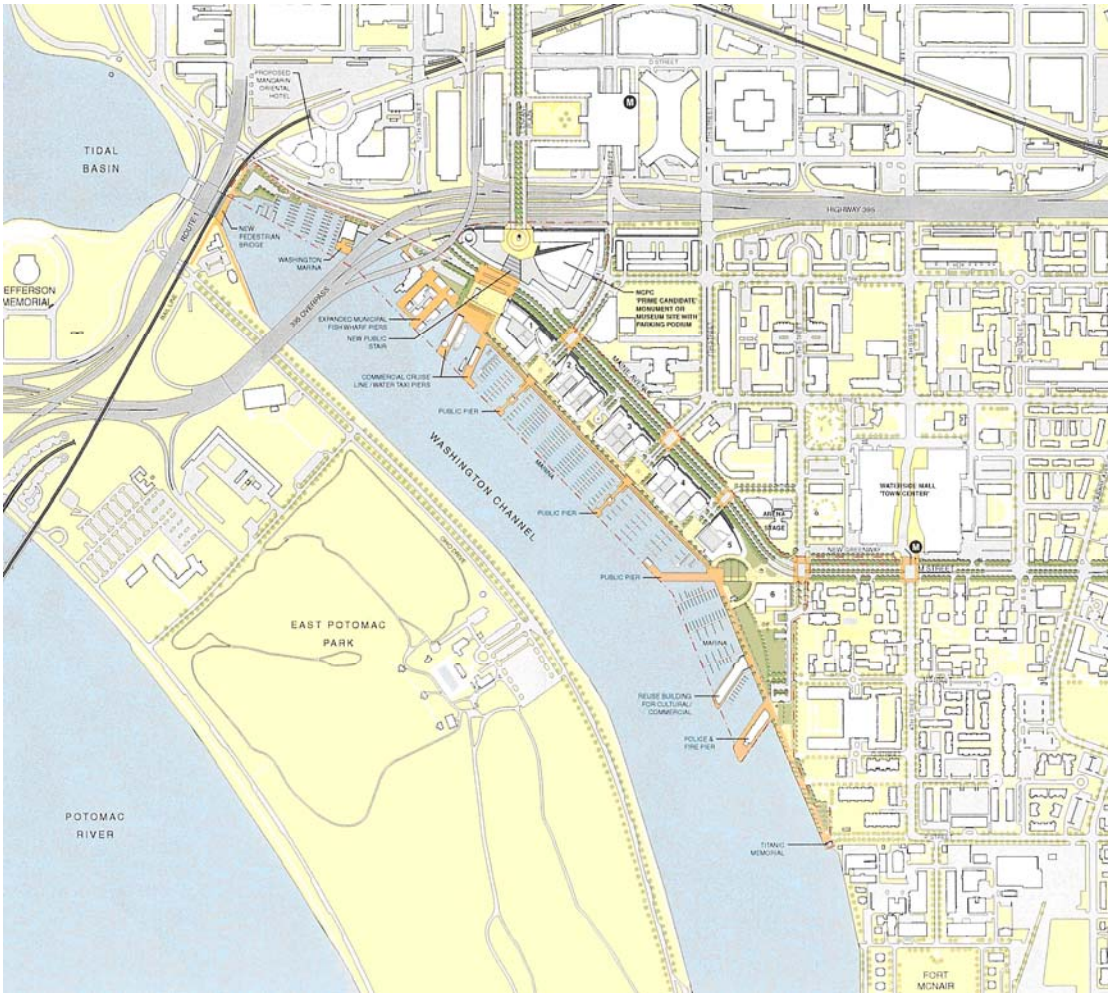


Figure 3.26.[16] This draft of the Southwest Waterfront Plan shows a major facelift for the area of land west of Maine Avenue.

Under the Anacostia Waterfront Initiative (AWI), the Office of Planning has drafted a development plan for the Southwest Waterfront. The following list summarizes the main goals of the plan that I will employ for my thesis site.

- Remove Water Street (fig. 3.27)
- Extending the street patterns to the waterfront and transforming Maine Avenue into a tree-lined boulevard (fig. 3.28).
- Create a series of public spaces along the waterfront (fig. 3.2)
- Develop a market square near the existing seafood market. (fig 3.30)

- Develop a civic space at the terminus of M street near the existing Arena Stage Theater (fig. 3.31)
- Relocate the existing cruise ships to the northern end of the site near the new market square. (fig. 3.32).

The plan also proposes guidelines for the new parcels of land such as building use, height restrictions, and FAR requirements (fig. 3.34-35).

Figure 3.27.[17] Water Street is unnecessary due to its adjacent and parallel relationship to Maine Avenue. Currently the street is a low volume road used mainly to access parking lots. The removal of Water Street and its parking lots will create more waterfront land and reduce the disconnection between the neighborhood and the waterfront. (AWI)

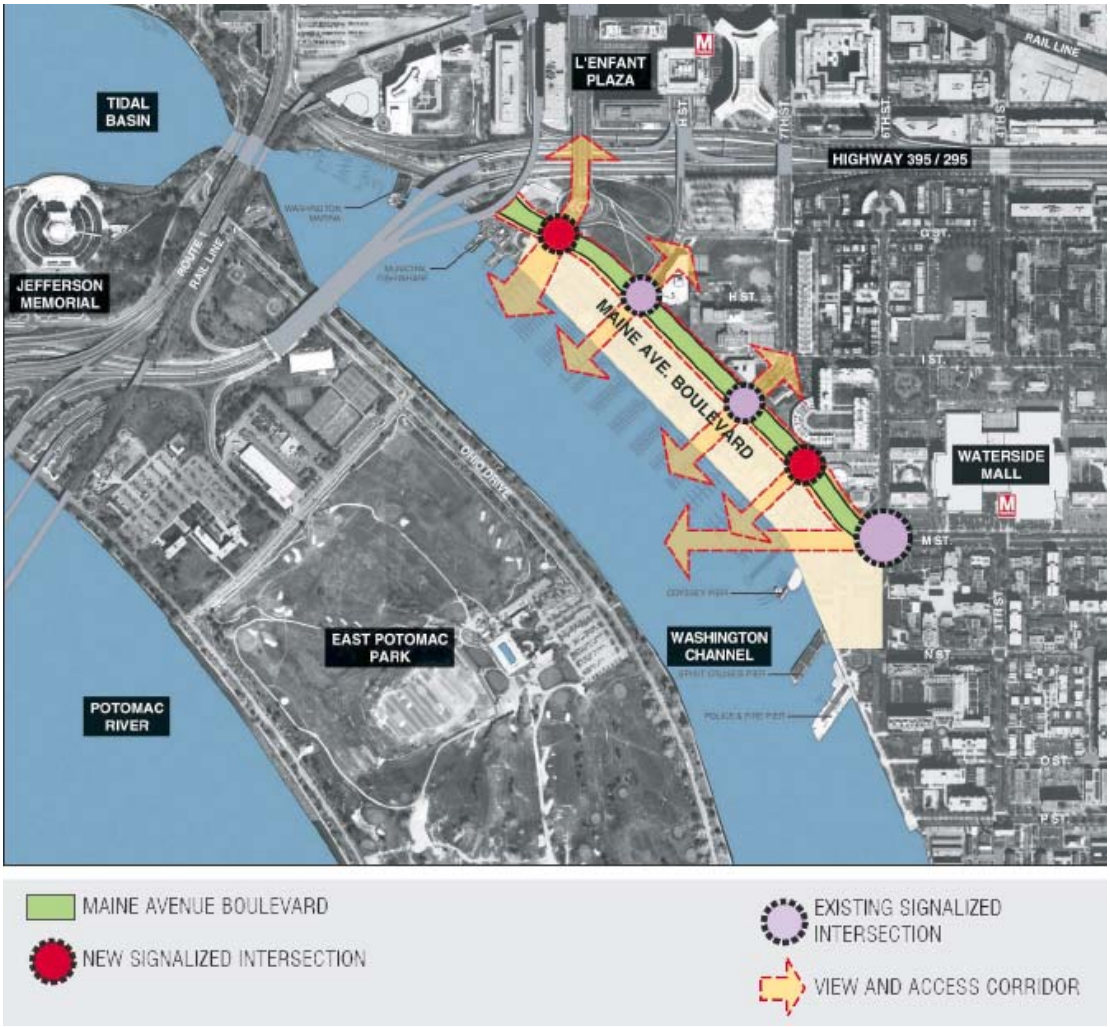


Figure 3.28.[18] Maine Avenue will be transformed into a boulevard that will also include the addition of two more intersections. The street will be designed to promote the crossing to the waterfront. Some streets will be extended through Maine Avenue to public spaces along the waterfront.

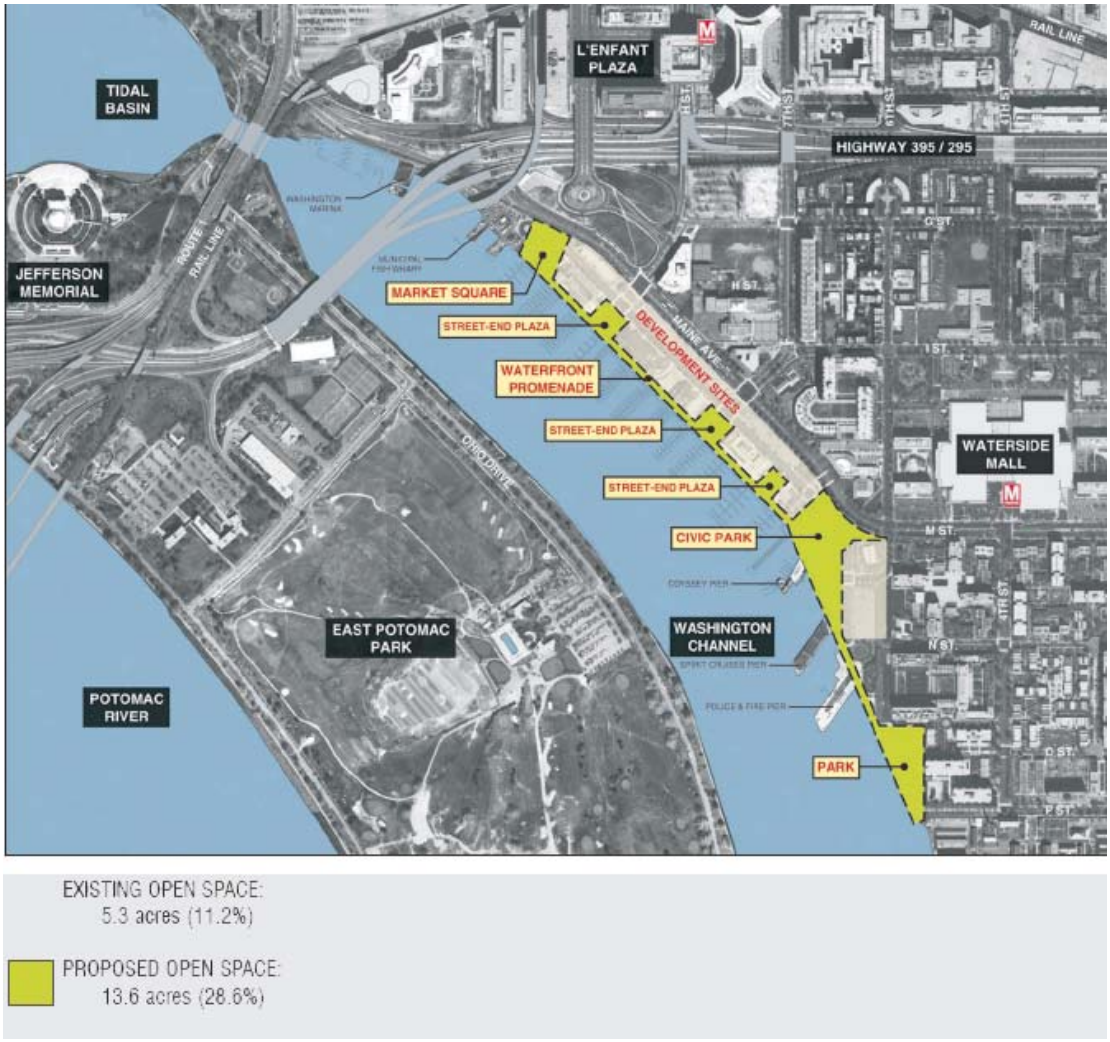
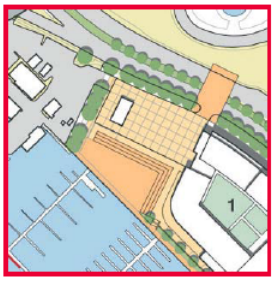


Figure 3.29.[19] The plan also includes several new zones designated for public spaces.



Market Square Concept Plan (red oval at right)

Figure 3.30.[20] The development plan adds a market square at the northwest end of the site. Adjacent to the square will be the existing seafood market and the proposed retail buildings.

Civic Park Concept Plan (red oval at right)

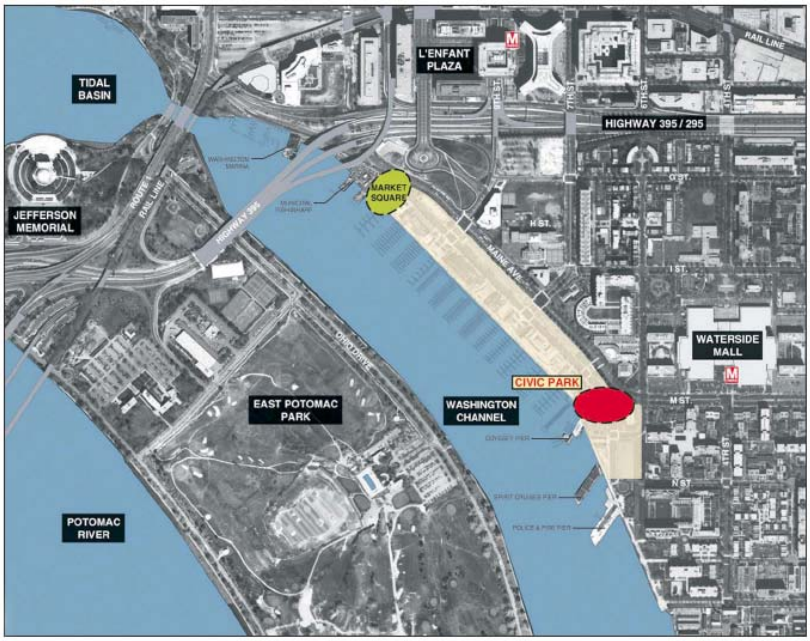


Figure 3.31.[21] The development plans also proposes a civic plaza to be developed to the Southeast of the new development. The plaza will be flanked by the existing Arena Stage and proposed civic and cultural functions. (AWI)

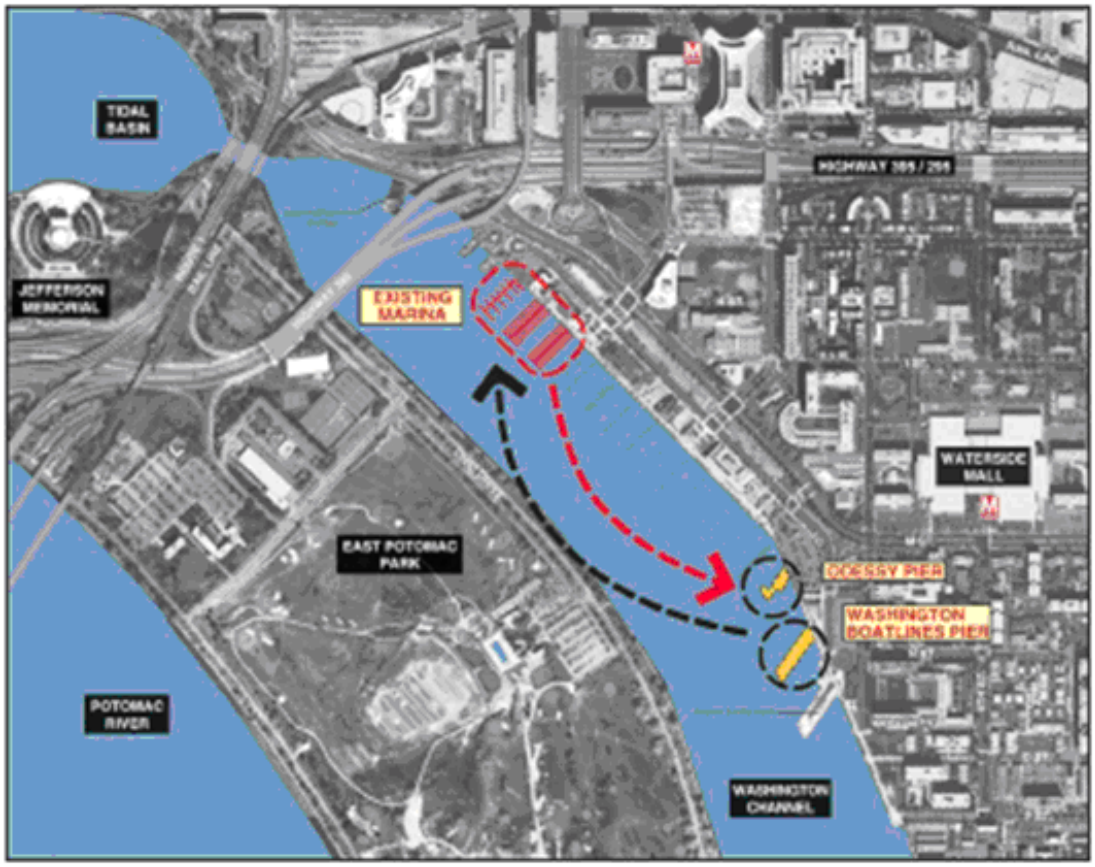


Figure 3.32.[22] Under the Southwest Waterfront Vision, the cruise ships located adjacent to the museum site will move to two new piers located adjacent to the Fish Market. The relocation of the cruise ships will relieve a current land-use conflict between the traffic and activity of the cruise lines and the adjacent quiet residential neighborhood. The move will also locate the cruise lines appropriately, concentrating commercial uses around the proposed Market Square. The existing marina slips will be reconfigured to accommodate the relocation of the cruise ships.

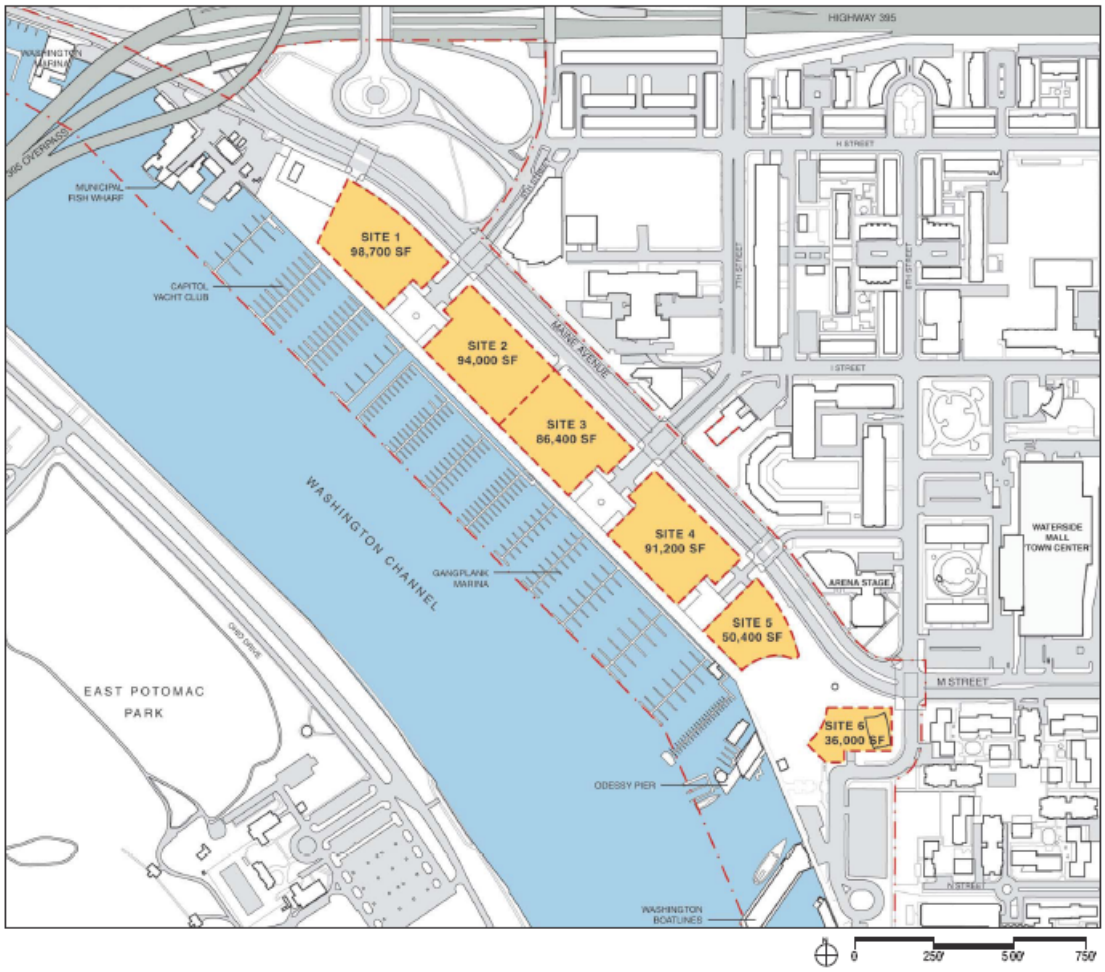


Figure 3.33.[23] This new site plan displays the new parcels of land created by the development. The two sites being considered for the project are sites 5 and 6.

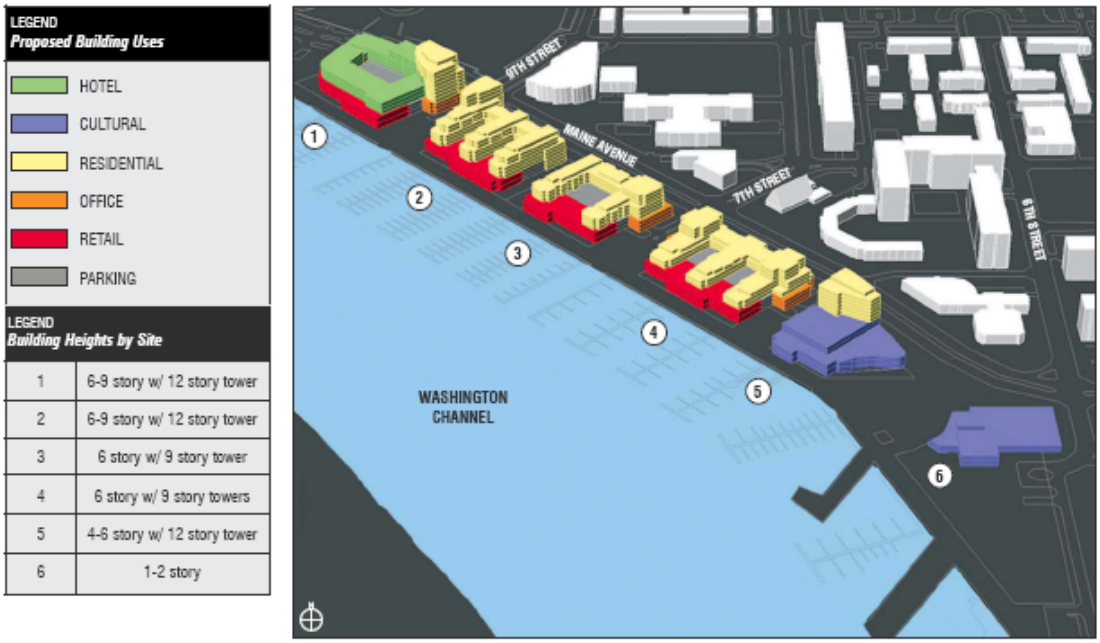


Figure 3.34.[24] The plan proposes the use of several mixed use buildings along the waterfront. The buildings have a unique massing that is intended to preserve sight lines. The program of the buildings features parking, office, and retail on the lower levels and residential above.

Development Program by Site

SITE	BLDG FAR AREA	RESIDENTIAL	UNITS	HOTEL	UNITS	OFFICE	RETAIL	CULTURAL
1	413,000 sf	76,000 sf	60-70	215,000 sf	400-450	17,000 sf	76,000 sf	0
2	462,000 sf	304,000 sf	275-290	0	0	17,000 sf	54,000 sf	0
3	320,000 sf	168,000 sf	150-160	0	0	17,000 sf	47,000 sf	0
4	437,000 sf	233,000 sf	210-220	0	0	33,000 sf	56,000 sf	0
5	238,000 sf	87,000 sf	75-85	0	0	0	0	150,000 sf
6	50,000 sf	0	0	0	0	0	0	50,000 sf
Total	1,940,000 sf	868,000 sf	770-825	215,000 sf	400-450	84,000 sf	233,000 sf	200,000 sf

Figure 3.35.[25] This chart presents guidelines for the FAR and uses in the new waterfront buildings. I will accept this information for sites 1-4; however, I will not accept the guidelines specified for site 5 and 6, which are being considered for the site of the Maritime Aquarium.

The Maritime Aquarium

An Educational Civic Building

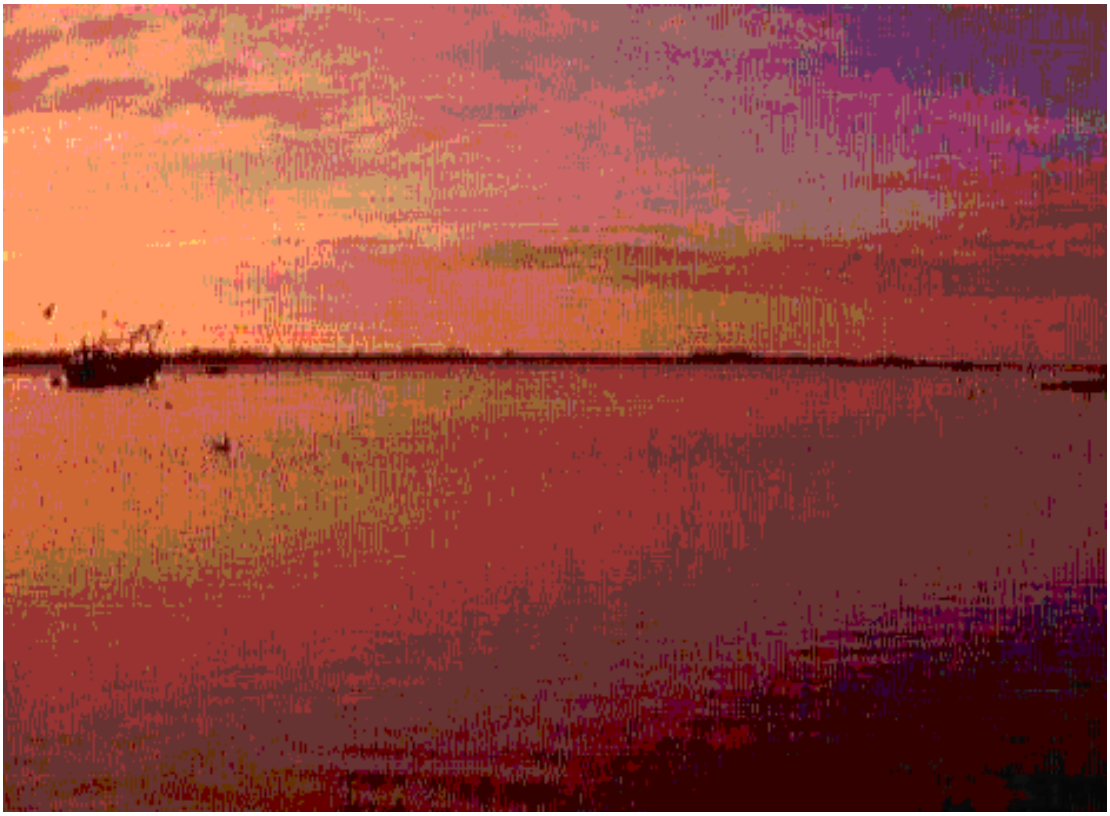


Figure 4

The Washington D.C. Maritime Aquarium

The Washigton D.C. Maritime Aquarium is a unique museum that features two main components; the Marine Discovery Center and the L'Enfant Maritime Museum. The museum focuses primarily on the local waterways extending to the Chesapeake Bay.

Marine Discovery Center

The Marine Discovery Center exhibits will feature fresh water aquariums, live animal exhibits, flowing stream tables and a wet lab. These exhibits will allow the viewers to get up close and personal with fish, birds, frogs, turtles, snakes, shellfish, crabs, reptiles, and amphibians of the Chesapeake Bay watershed. The exhibits will be segmented into regions starting at the local level and ending at the Eastern Shore at the Atlantic Ocean. The following exhibits will be included within the Marine Discovery Center.

The Capital Waterways

This exhibit will include a series of small aquariums representing the unique ecosystem of the Anacostia and Potomac Watershed.

Ecosystems of the Chesapeake

Similar to the Capital Waterways exhibit, the Ecosystems of the Chesapeake will feature a series of small aquariums representing the unique ecosystem of

the Chesapeake Bay Watershed. The exhibits will include the following species; American eel, American shad, Atlantic croaker, Atlantic menhaden, Black-drum, Black sea bass, Bluefish, Cobia, Hogchoker, Lined Seahorse, Longnose Gar, Northern Puffer, Red Drum, Searobin

Sturgeon Exhibit

This large exhibit will focus on the ancient Atlantic Sturgeon. The history and interesting look of the sturgeon will most likely make it one of the more popular exhibits.

Shark Tank

The shark tank will feature the Sandbar shark. This exhibit will be the most popular exhibit and will be designed in a hierarchal way. The tank may be two stories tall.

Ray Exhibit

The Ray Exhibit will feature the cownose ray, which is often found in the Chesapeake. The exhibit will be held in a larger tank that may be lower than the level of the visitor offering an aerial view of the species.

Eel Tank

The Eel Tank will feature the American Eel, which is common throughout the Chesapeake Bay watershed. The exhibit will be a medium-sized exhibit.

Touch Tank

The touch tank will allow visitors to come in closer contact with the exhibits by allowing them to touch and handle particular species. The touch tank will most likely feature starfish, horseshoe crabs, Maryland crabs, oysters,

crayfish, silver dollars, clams, and other echinoderms, crustaceans and mollusks. A large shallow tank at waist level will display the species. The exhibits will be species found within the Chesapeake Bay watershed as well as species found on the shores of the Maryland Eastern Shore.

Greenhouse or dry exhibit

This exhibit deals with the plant life that occurs within and adjacent to the bodies of water featured in the Chesapeake Bay Watershed. Although the exhibit is not aquatic, it is appropriate for the aquarium exhibits because the museum concentrates on the entire ecosystem of the watershed. The exhibit will also feature waterbirds such as dabbling ducks, diving ducks, geese, and swans.

Hi-def Journey Theater

This is a small theater exhibit which provides visitors with a 15 minute virtual tour of the ecosystem of the Chesapeake Bay watershed. The exhibit simulates a helicopter ride that begins at the site of the museum and follows the Potomac River to the Chesapeake Bay and ends in the Atlantic Ocean. Along the ride, man's relationship with nature will be highlighted.

Changing Exhibit

This exhibit will be sized similarly to the smaller exhibits and will feature a revolving selection of species and other types of exhibits.

The L'Enfant Maritime Museum

The L'Enfant Maritime Museum focuses on the fascinating story of Washington's waterways including development along the Potomac and Anacostia rivers as well the construction of canals in the Nation's Capital. These exhibit areas vary in size with the collections. Some unobstructed, lofty and large halls are necessary to house large-scale artifacts such as small water craft and full scale partial reconstructions. Providing an opportunity to view large scale exhibits from multiple levels would be optimal.

Educational Program

The museum also serves as an educational and cultural location for the citizens and visitors of Southwest. To accommodate this, the museum will also hold a one hundred fifty seat auditorium with two small classrooms to provide for activities such as lectures, films, and community meetings.

Library/ Archive

The library will feature Books, documents, photographs, and manuscripts of Washington's waterways.

Public Facilities

The lobby will be located directly off the main entrance and should be immediately accessible to the ticket booth, gift shop, coat room, and the auditorium.

Administration, Research

This portion of the program will most likely be located on the Eastern edge of the site preserving water views for the exhibit space. Administrative, finance, and curatorial offices should be grouped within a close proximity of another.

Community relations, education, and clerical space should also be adjacent to one another.

Research labs need to be located near the back-up spaces and holding tanks. The exhibit food services should also be located in close proximity to the research labs and back-up spaces.

Exhibit Back-Up

An efficient exhibit back-up operation is one of the most important elements of aquarium design. The areas feature holding tanks for sick or surplus specimens and also allow for the maintenance of tanks and the treatment of specimens. Figure 4.0 illustrates the parts and locations of a proper back-up area

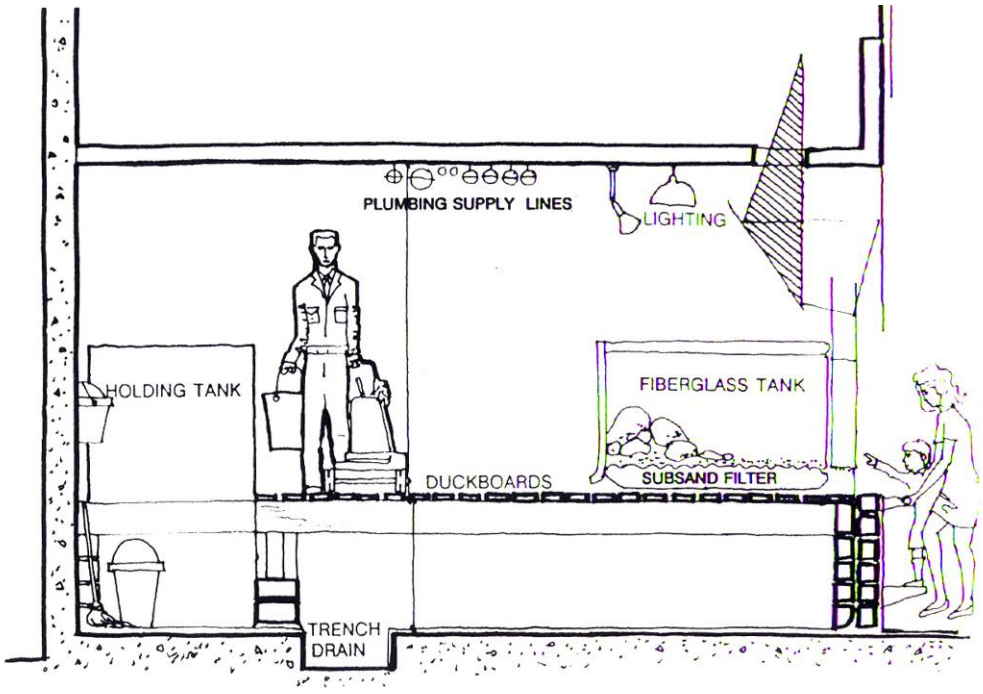


Figure 4.0.[26] The work area floor should be elevated approximately three feet higher than the public floor. Holding tanks should be placed along the rear wall of the back-up area and each of the holding tanks should have its own recirculation system. The holding capacity should be one-third of the display volume.

Service Areas

The shipping and receiving area should be hidden from the pedestrian's view due to the disposal of various wastes. The trash services should also be located by the loading dock.

Building Program Tabulations

Entrance Zone	
Ticket Queue	300 sf.
Ticket Counter	100 sf.
Cash Room	100 sf.
Entrance Lobby Hall	2,000 sf.
Giftshop/ Storage/ Office	1,500 sf.
Restrooms	500 sf.
First Aid	250 sf.
Coat Room	500 sf.
Subtotal	5,250 sf.
Food Service	
Café	1,100 sf.
Catering Kitchen	400 sf.
Subtotal	1,500
Education	
Auditorium	1,500 sf.
Stage Area	300 sf.
Projection Room	150 sf.
Classroom/ Wet lab	900 sf.
Classroom	900 sf.
Classroom	900 sf.
Subtotal	4,650 sf.
Discovery Center Exhibits	
Wet Exhibits	

Intro		350 sf.
DC Fish		
	Circ.	1,000 sf.
	Exhibit	1,000 sf.
	Reserve/ Holding	300 sf.
	Backup	600 sf.
Chesapeake Bay Fish		
	Circulation	1,500 sf.
	Exhibit	1,500 sf.
	Reserve/ Holding	500 sf.
	Backup	1000 sf.
Ancient Sturgeon		
	Circulation	500 sf.
	Exhibit	500 sf.
	Reserve/ Holding	200 sf.
	Backup	400 sf.
American Eel		
	Circulation	400 sf.
	Exhibit	400 sf.
	Reserve/ Holding	200 sf.
	Backup	400 sf.
Cownose Ray		
	Circulation	750 sf.
	Exhibit	750 sf.
	Reserve/ Holding	200 sf.
	Backup	500 sf.
Sandbar Shark		
	Circulation	750 sf.
	Exhibit	750 sf.
	Reserve/ Holding	200 sf.
	Backup	400 sf.
Touch Tank		
	Circulation	750 sf.
	Exhibit	750 sf.
	Reserve/ Holding	200 sf.
	Backup	400 sf.
Subtotal	13,350	

*Reserve Tank Located in Backup

Special Exhibits		
Hi-Def Journey Theater		
	Intro.	500 sf.
	Interactive Theater	750 sf.
	Projection Room	100 sf.

	Greenhouse	
	Intro.	250 sf.
	Exhibit	1000 sf.
	Changing Exhibits	
	Circulation	1,000 sf.
	Exhibit	1,000 sf.
	Backup	500 sf.
	Subtotal	5,100 sf.
L'Enfant Maritime Museum		
	Intro.	500 sf.
	Exhibit Areas	12,000 sf.
	Subtotal	12,500 sf.
Archives		
	Curator's Office	200 sf.
	Archive Storage (Stacks)	1,800 sf.
	Archive Library	200 sf.
	Work Room	750 sf.
	Media	250 sf.
	Copy Room	100 sf.
	Reading Room	250 sf.
	Secure Room	100 sf.
	Subtotal	3,650 sf.
Administration		
	Reception	100 sf.
	Admin. Asst to Dir.	255 sf.
	Director's Office	200 sf.
	Large Conference	350 sf.
	Marketing Office	150 sf.
	Accounting Office	150 sf.
	Volunteer/ Staff Room	250 sf.
	Group Tour Manager	150 sf.
	Operations Director	150 sf.
	Small Conference Area	150 sf.
	Development Director	150 sf.
	Assistant	150 sf.
	Assistant for Ed. Director	150 sf.
	Educ. Director	150 sf.
	Curator's Office	150 sf.
	Copy Room	100 sf.
	File Room	100 sf.

Server Room	100 sf.
Kitchenette	100 sf.
Subtotal	3,255 sf.
Aquarium Back of House	
Food Prep/ Freezer	400 sf.
Lab	150 sf.
Aquarist Office	150 sf.
Quarantine Rooms	700 sf.
Freshwater Holding Tank	150 sf.
Dive Room/ Shower	75 sf.
Rest rooms (staff)	75 sf.
Receiving	500 sf.
Subtotal	2,200 sf.
Curatorial Services	
Artifact Storage	7,000 sf.
Receiving/ Loading	1,000 sf.
Shop/ Exhibit Design	1,500 sf.
Equipment Storage	750 sf.
Graphics/ Storage	1000 sf.
Subtotal	11,250 sf.
Total	62,705 sf.
Other	
Circulation (16%)	10,032 sf.
Mechanical Rooms (10%)	6,270 sf.
Additional Bathrooms	700 sf.
Grand Total	79,707 sf.

Functional Considerations for Aquarium Design

A characteristic that is vital to a museum's success is the need to capture and hold the viewer's attention. The aquarium is no exception to this aspect of museum design; however, the design of an aquarium requires a set of functional considerations that are extremely unique to aquarium design. David Gross, former Director of the National Aquarium, developed the following guidelines in his proposal for the Master Plan for the National Aquarium.

1. Activity: Species are more interesting to the viewer while in motion. Therefore, an adequately sized tank is important to provide ample room for movement.
2. Large Size: The larger species tend to be the most popular. A large species is more impressive in a large tank.
3. Proximity: The viewers should be no less than four feet from the tank. A rule of thumb developed by Cambridge Seven for the New England Aquarium is that the length of the tank should be two to three times greater than the horizontal depth of the tank.
4. Circulation: A one-way circulation system reduces crowding at interesting exhibitions and speeds circulation.
5. Reputation: Visitors tend to be more attracted to species believed to be dangerous.

6. Inherent Characteristics: Viewers tend to be attracted to species with bright color or perceived beauty as well as unusual shapes and species perceived as ugly.
7. Lack of Barriers: Distractions such as reflection and algae on the exhibition glass are problematic as they allow for too many hiding spaces for the exhibits.
8. Added senses: Children and adults are intrigued by exhibits such as touch tank's which allow participants to involve other senses, such as smell and touch.
9. Vicarious Participation: Viewers enjoy watching employees feeding the exhibits from feeding platforms above the tanks as well as within the tanks.
10. Lounge Areas: Lounge areas located adjacent to main circulation routes are helpful when visitors want to take a respite away from the aquatic world.
11. Display: Variation through different sizes, colors, and grouping is important to relieving boredom. For example, the transition between a live exhibit and a digital or photographic display can be interesting. The aquarium should exhibit aquatic species in stimulated natural environments as much as possible.[27]

Precedents

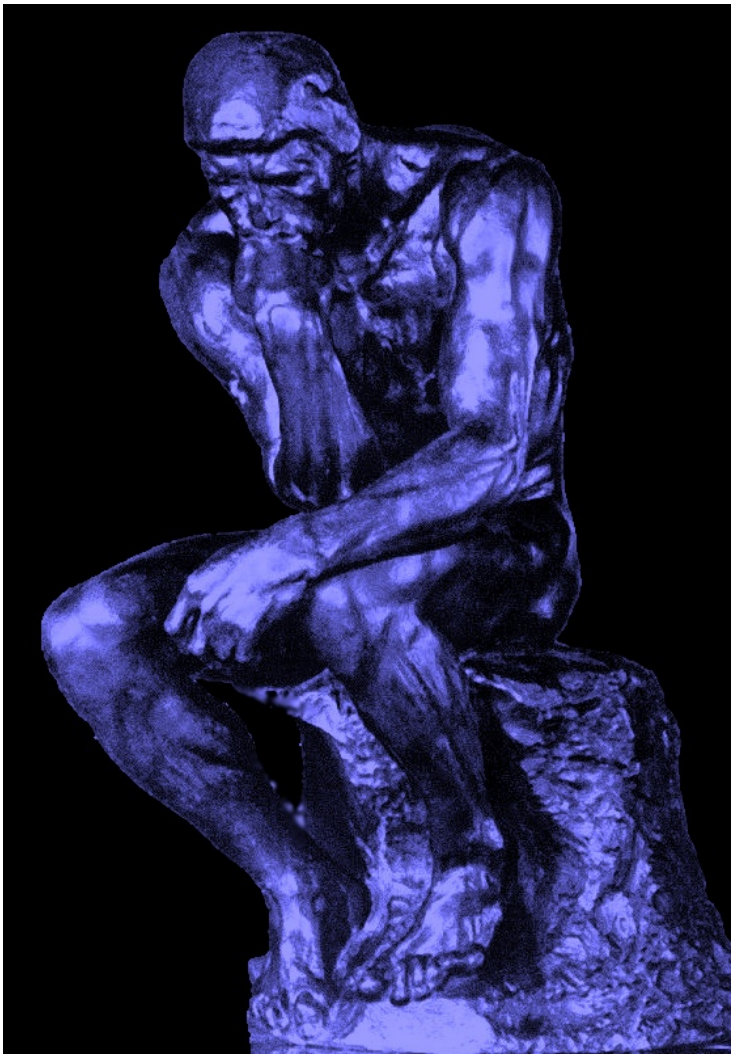


Figure 5.0. *The Thinker*, August Rodin, 1880

Influences as Form Determinants

The Maritime Aquarium must cleverly address the functional problems created by the dual program of an aquarium and maritime museum. The museum also must be an iconic civic building at the water's edge that symbolizes the unruly relationship between humans and nature.

Monterey Bay Aquarium, California

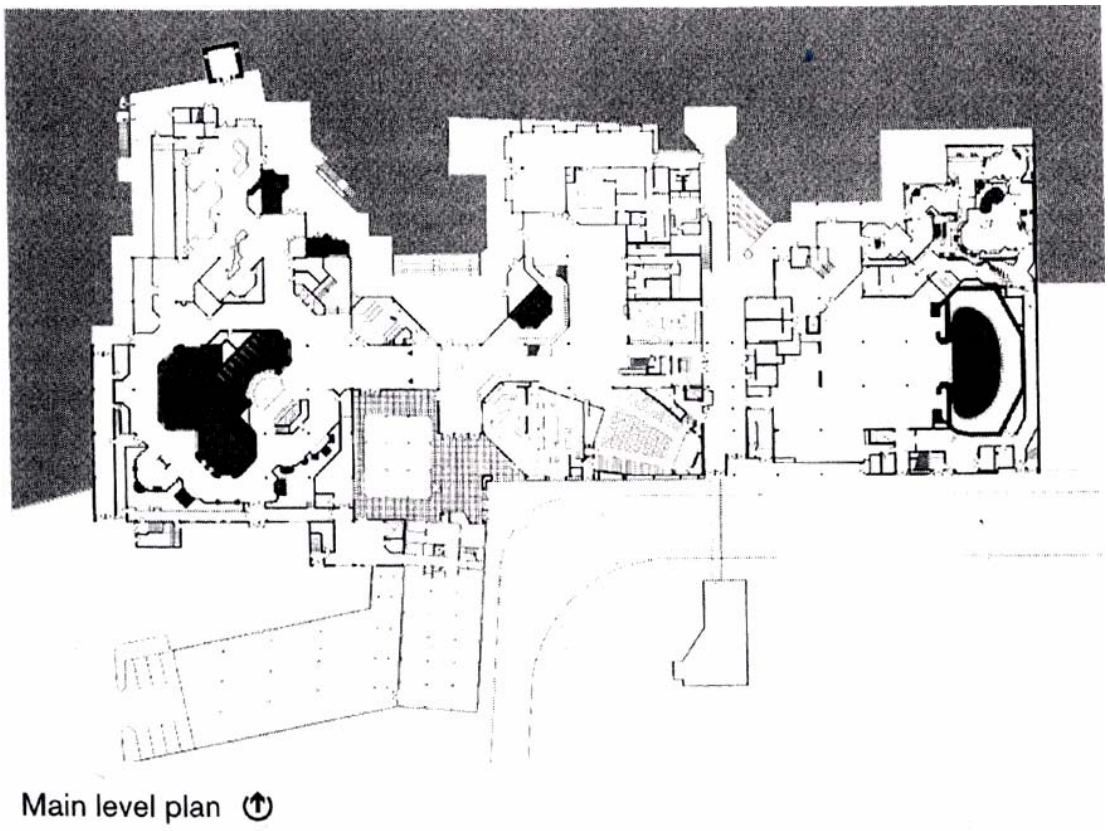


Figure 5.1. Ground level plan.[28]

The Monterey Bay Aquarium by Esherick, Homsey, Dodge, and Davis is a world class aquarium located at the site of an abandoned sardine cannery at the edge of the Monterey Bay. As a public, non-educational facility, the aquarium also features an independent marine research institute. The Monterey Bay Aquarium focuses on the unique marine ecology of one habitat: the Monterey Bay and its shoreline.

One of the unique aspects of the building is its usage of the free plan, which presents the visitor with a free-range of circulation choices rather than locking them into a single path. Figures 5.2-5 show the placement of major program elements. Although some of the exhibits are engaged into the perimeter walls, most of the exhibits are found in the center of the spaces they occupy. The exhibits become objects in space that allow for circulation around the entire perimeter of the tanks.

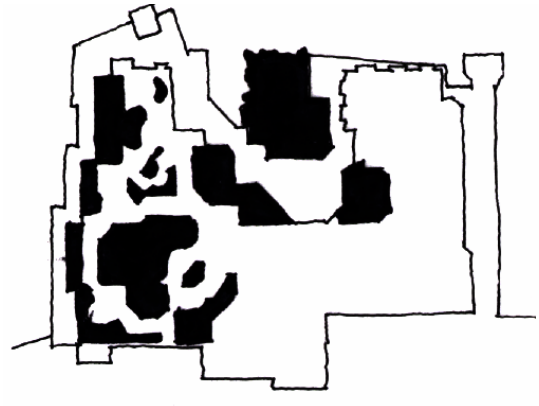


Figure 5.2. Exhibits

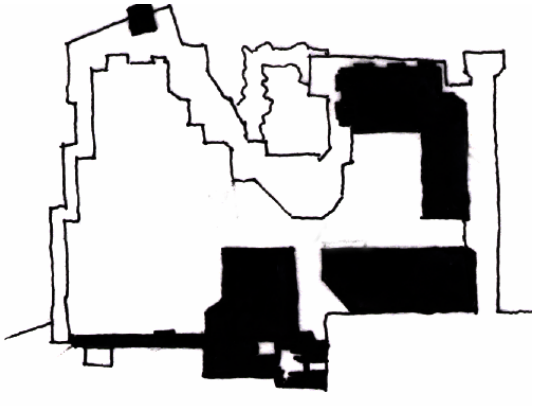


Figure 5.3 Support

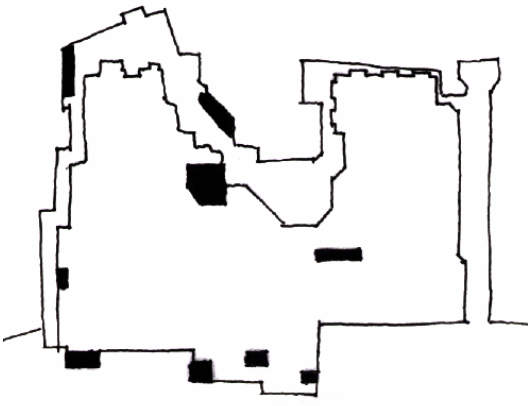


Figure 5.4 Vertical Circulation

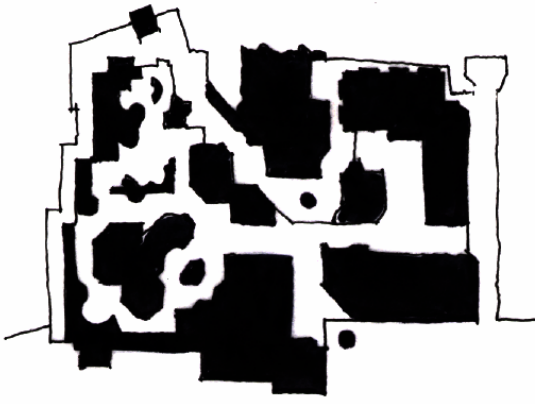


Figure 5.5. Figure Ground

The exhibit placement is extremely clever because it prevents the visitor from occupying the center of the building. Visitors are instead pushed to the edge of the

building bringing them closer to the heavily glazed north façade of the building, allowing them to orient themselves in the building as well as engage the bay. The result is a space where the interior and exterior spaces become meshed together.

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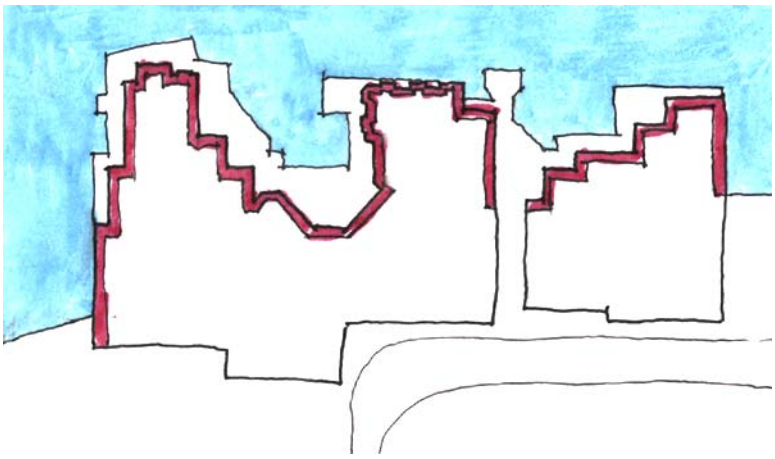

Figure 5.6.The aquarium maximizes exposure to the bay by stepping the north façade in plan, which increases the amount of perimeter wall and increases the amount of natural light.

Figure 5.7. Poche elements of the building such as administrative and curatorial services are located on the South side of the building reserving northern exposure to the bay for exhibit space.

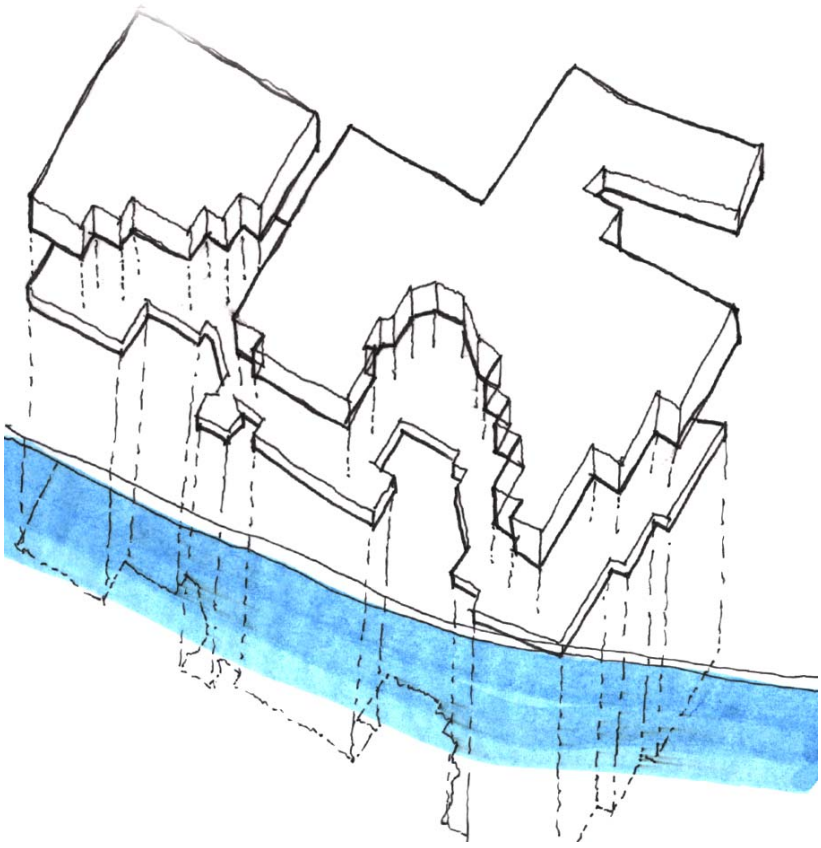

Figure 5.8. The aquarium rests half on water half on land.

As figure 5.8 exhibits, the northern half of the building actually extends over the water reinforcing its strong connection to the outdoors. As the building sits half over the water and half on the land it begins to participate with the environment it examines.

National Mississippi River Museum and Aquarium, Dubuque, Iowa

Figure 5.9. An exterior view of one of the aquarium exhibits.

The Mississippi River Museum and Aquarium by Esherick, Homsey, Dodge, and Davis has a building program that is very similar to the Washington DC Maritime Aquarium. The museum contains aquarium exhibits as well as maritime exhibits. Both programs feature exhibits exclusively about the Mississippi River. The museum has 3 major program elements. The William Woodward Discovery Center has five large aquariums plus many other aquatic exhibits. The National Rivers Hall of Fame exhibits the history of famous people who discovered, lived upon, and celebrated the waterways of the United States. The Fred W. Woodward Riverboat Museum celebrates the history of riverboats on the Mississippi through interactive exhibits and historic artifacts.

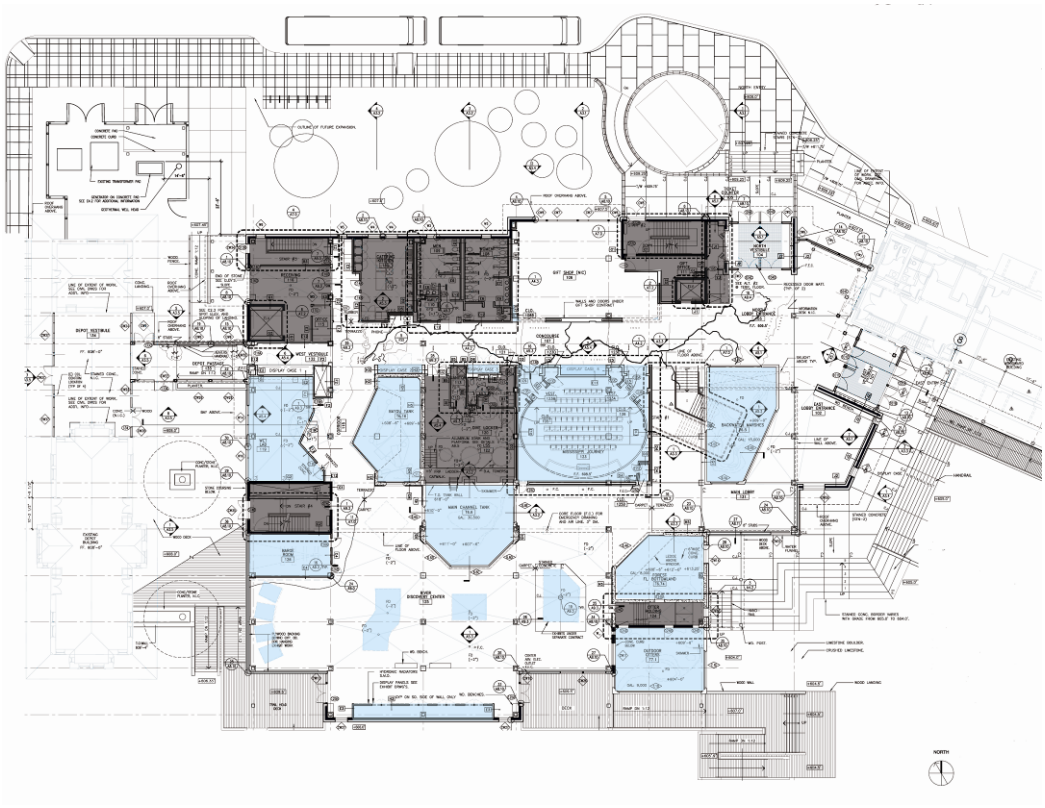

Figure 5.10. The aquarium exhibits (blue) are located on the ground level. The aquarium exhibits are placed in a variety of different methods, which is similar to the Monterey Bay Aquarium. Some exhibits are engaged into the perimeter walls while some exhibits are free-standing. Service functions are rendered grey.

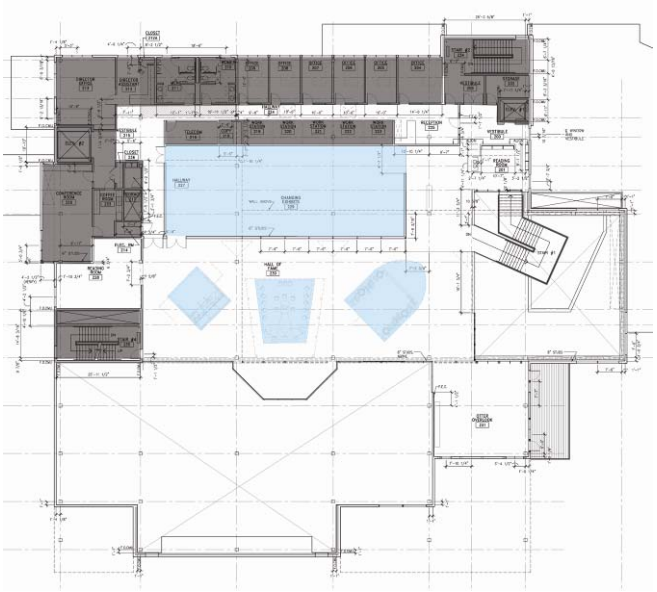

Figure 5.11. The National Rivers Hall of Fame and other Maritime exhibits are located on the second floor. The administrative and curatorial services are also located on the second floor.

Building Program Tabulation

Entrance Building	
Covered Queue	
Ticket Queue	300 sf.
Ticket Counter	100 sf.
Entrance Lobby	500 sf.
Giftshop/ Storage/ Office	1,500 sf.
Restrooms	500 sf.
First Aid	250 sf.
Cash Room	100 sf.
Covered Picnic	
Dumpster	
Subtotal	3,250 sf.
Food Service	
Café	750 sf.
Catering Kitchen	500 sf.
Subtotal	1,250
Museum – Exhibits	
Entrance Lobby	700 sf.
Restrooms	270 sf.
Coat rooms	200 sf.
Information	100 sf.
Wet Exhibits	
Intro	350 sf.
Discovery Slough	
Circ. 1,000 sf.	
Discovery Exhibit	950 sf.
Floods/ water quality	1,500
Reserve/ Holding	200 sf.
LSS	
Lower Pool	
Circulation	750 sf.
Exhibit	350 sf.
Reserve/ Holding	600 sf.
LSS	900 sf.
Central Pool	
Circulation	750 sf.

	Exhibit	500 sf.
	Reserve/ Holding	200 sf.
	LSS	400 sf.
Upper Pool (Backwater Slough)		
	Circulation	750 sf.
	Exhibit	750 sf.
	Reserve/ Holding	200 sf.
	LSS	
Dry Exhibits		
River of Choices		
	Intro.	500 sf.
	Interactive Theater	750 sf.
	Projection Room	100 sf.
Mile Marker 580		
	Ice Harbor	100 sf.
	Dubuque	2,500 sf.
	The Future	100 sf.
	River of Dreams	1,000 sf.
Changing Exhibits		
	Exhibit Hall	3,000 sf.
Subtotal		19,250 sf.
Back of House		
Food Prep./ Freezer		400 sf.
Lab		150 sf.
Aquarist Office		150 sf.
Quarantine Rooms		700 sf.
Freshwater Holding Tank		150 sf.
Dive Room/ Shower		75 sf.
Rest rooms (staff)		75 sf.
Receiving		500 sf.
Subtotal		2,200 sf.
Woodward Riverboat Exhibit		
Intro.		500 sf.
Gift shop		600 sf.
Steamboat Exhibit		1000 sf.
Naturalist's Study		450 sf.
Woodward		12,000 sf.
Boat building		1,700 sf.
Subtotal		16,250
Archives		

	Curator's Office	200 sf.
	Archive Storage (Stacks)	1,800 sf.
	Archive Library	200 sf.
	Work Room	750 sf.
	Media	250 sf.
	Copy Room	100 sf.
	Reading Room	250 sf.
	Secure Room	100 sf.
	Subtotal	3,650 sf.
Education		
	Classroom/ Wet lab	900 sf.
	Subtotal	900 sf.
Administration		
	Reception	100 sf.
	Admin. Asst to Dir.	255 sf.
	Director's Office	200 sf.
	Large Conference	350 sf.
	Marketing Office	150 sf.
	Accounting Office	150 sf.
	Volunteer/ Staff Room	250 sf.
	Group Tour Manager	150 sf.
	Operations Director	150 sf.
	Small Conference Area	150 sf.
	Development Director	150 sf.
	Assistant	150 sf.
	USFW Office	100 sf.
	Assistant for Ed. Director	150 sf.
	Educ. Director	150 sf.
	Curator's Office	150 sf.
	Subtotal	2,855 sf.
Curatorial Services		
	Artifact Storage	7,200 sf.
	Receiving/ Loading	1000 sf.
	Shop/ Exhibit Design	750 sf.
	Equipment Storage	750 sf.
	Graphics/ Storage	1000 sf.
	Subtotal	10,700 sf.
Total		60,305 sf.

Other		
	Circulation (16%)	9,648 sf.
	Mechanical Rooms (10%)	6,030 sf.
	Additional Bathrooms	700 sf.
Grand Total		76,683 sf.[29]

New England Aquarium, Boston, Massachusetts

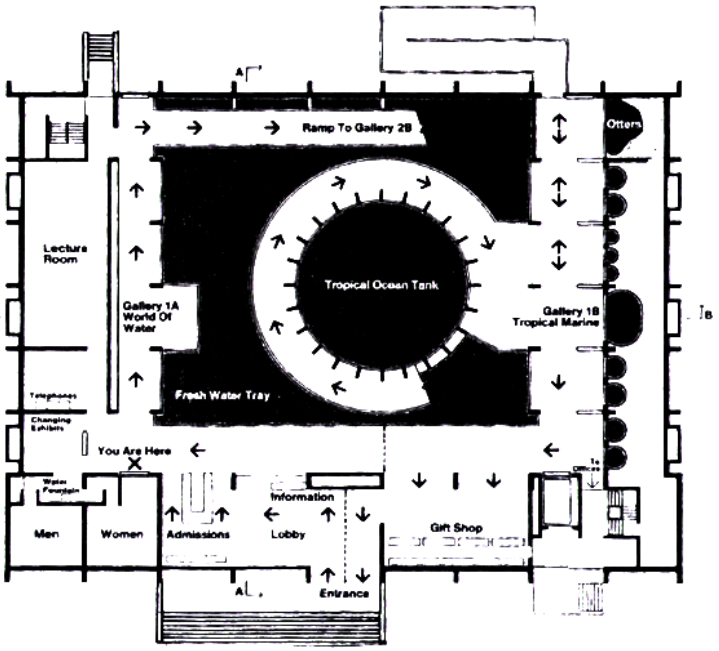

Figure 5.12. The New England Aquarium first level plan.

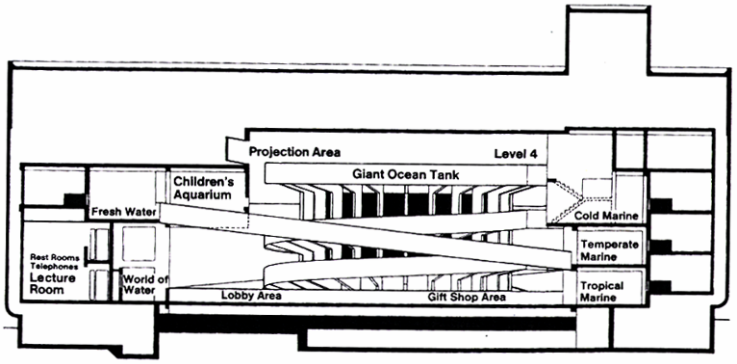

Figure 5.13. The New England Aquarium section.[30]

New England Aquarium by Cambridge Seven is dominated by the 180,000 gallon central sea water tank circumscribed by the rectangular volume of the building. Ascending to 4 stories, the drum stretches 40 feet in diameter. Unlike the Monterey

Bay Aquarium, the New England Aquarium uses a strict circulation pattern in the form of a series of ramps to govern the parti (fig. 5.15). Minimizing the distance of the viewer from the exhibits, the perimeter rectilinear ramps allow visitors to ascend the four levels of exhibits before descending via a spiral ramp surrounding the central ocean tank (fig. 5.16).

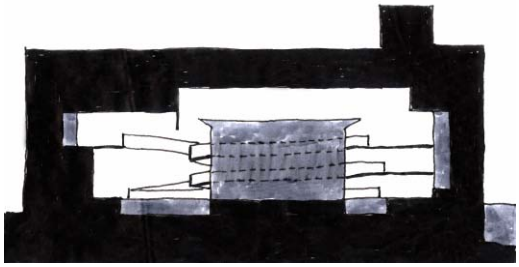

Figure 5.14. This section diagram renders the exhibit zones in grey and the service and poche elements in black. This drawing shows the introverted nature of the building.

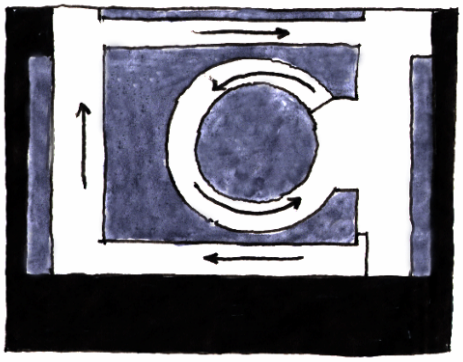

Figure 5.15. This parti diagram shows the simplicity of the building and its aggressive use of circulation as a design generator. The exhibit spaces are concentrated on the central hierarchal zone of the building. The service functions are located on the perimeter.

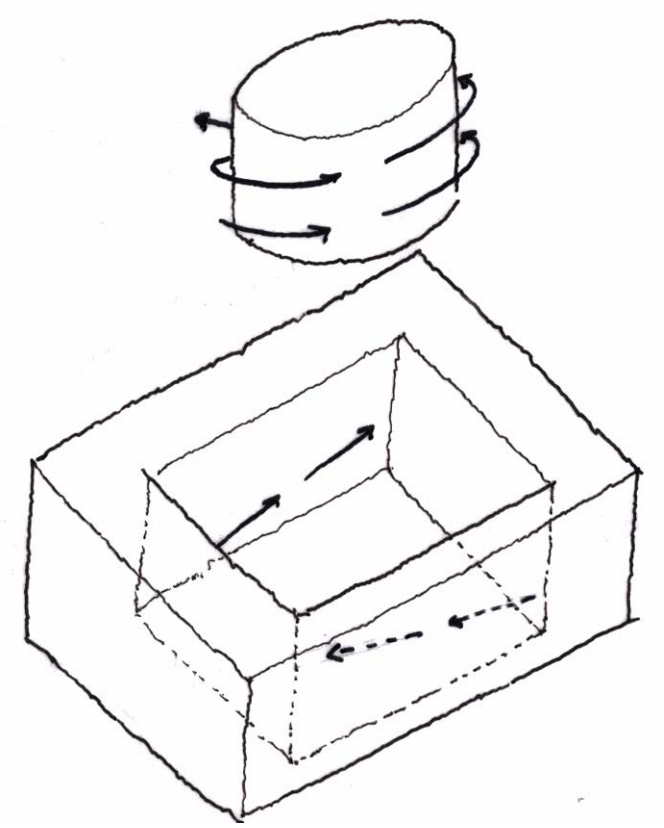

Figure 5.16. The aquarium features two circulation systems. Visitors may choose to circulate up the perimeter ramps of the rectangular volume before descending the spiraling ramp surrounding the central tank.

A major criticism of the building is its introverted nature, which restricts visual access and connection to the adjacent body of water. The building features exhibit and service space on all exterior walls thereby restricting natural light to the internal hierarchal zone. (fig. 5.14) The spiraling ramp is reminiscent to the ramp of Frank Lloyd Wright's Guggenheim Museum in New York. One major difference is that Frank Lloyd Wright left the interior of the cylinder as a void allowing for natural light to enter the building through a large skylight above the void. (fig. 5.18)

Figure 5.17. This interior photo shows the enclosed black-box environment created within the aquarium. There is no connection made to the outside world.

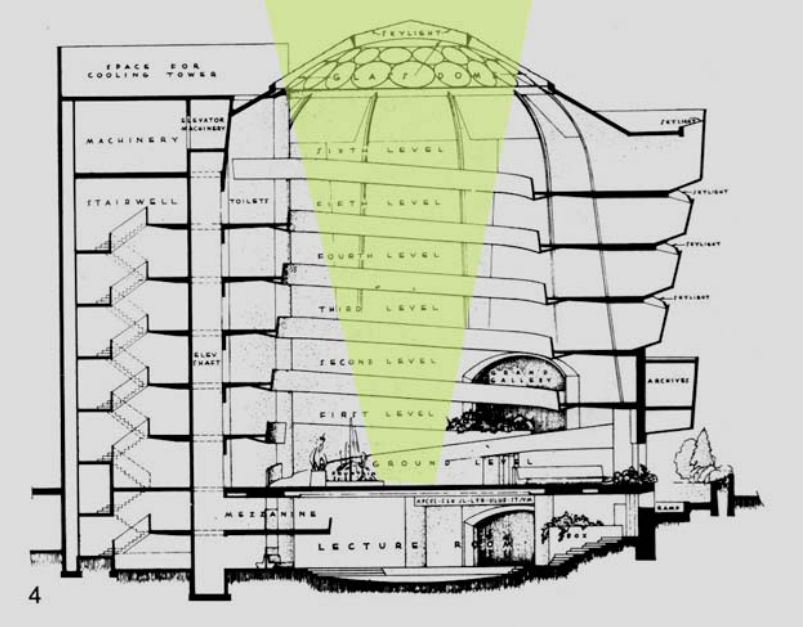

Figure 5.18. Frank Lloyd Wright's Guggenheim Museum captures natural light through the large skylight that hovers above the internal void inside of the spiraling ramp. The choice to put a large exhibit in the central void at the New England Aquarium denies the opportunity for natural light.

Maritime Center, Charleston, South Carolina

Figure 5.19. Night view of the Western Elevation with the waterfront in the background. .

The Maritime Center in South Carolina by Sasaki Associates is designed to meet the public needs of a recreational space and the private uses of the fishing industry. The ground floor features a large workroom for fish packing and sorting with a retail space on the northern end for the selling of the fish. The workroom features overhead industrial doors that open to the east to allow full access to the fishing boats. To the west the doors open to allow access for refrigerated trucks on the landside. The second contains a retail space, a large community space, and

offices for management of the marina. To the north of the building is a lawn area intended for large public gatherings.

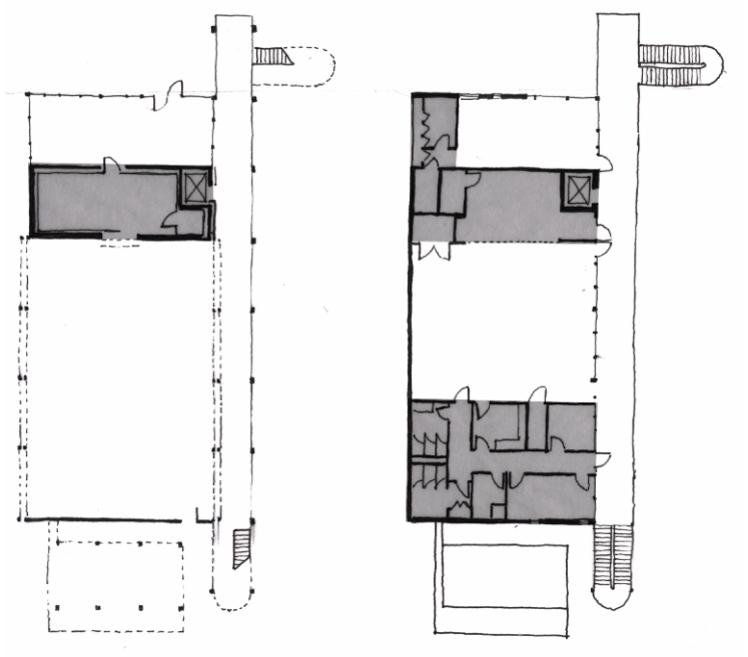

Figure 5.20. The ground floor (left) contains a large work room and a small retail space. The second floor contains office space, a meeting room and another retail space.

The style and site strategies of the building are noteworthy. It is obvious that Sasaki used water as an important metaphor in the buildings design. The curved form of the building's roof suggests the motion of waves (fig. 5.21). It also seems that the exterior circulation corridor was designed with a similar vocabulary of the nearby piers and bulkheads. Figures 5.22 and 5.23 illustrate this theme.

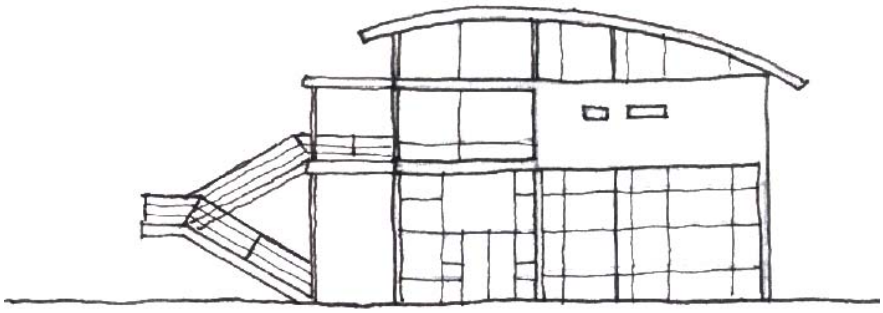

Figure 5.21. The curved form of the roof suggests the motion of waves.

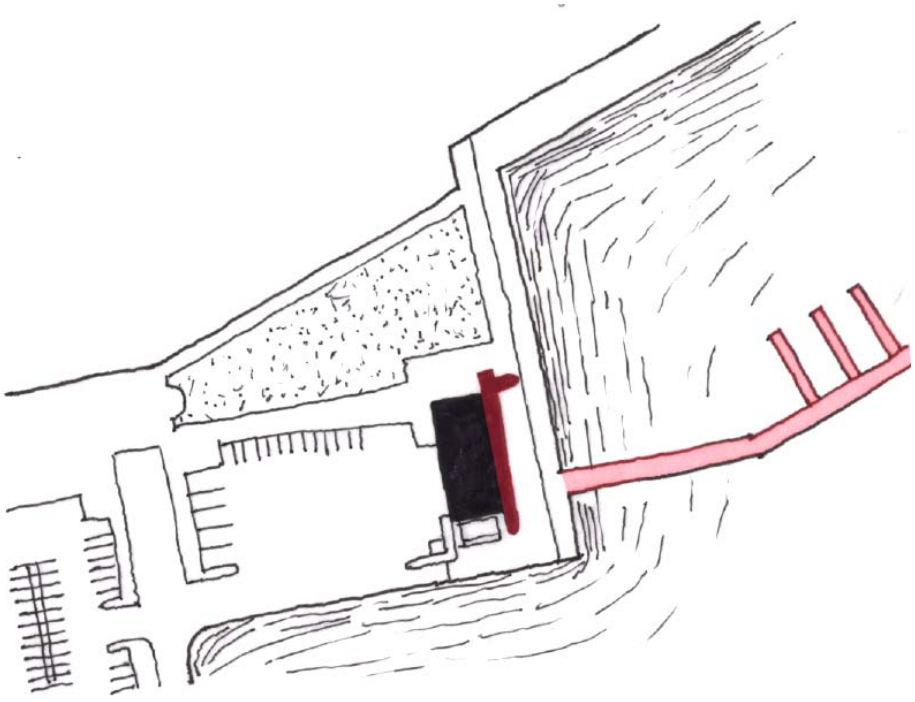

Figure 5.22. The exterior circulation corridor is proportioned similarly to the adjacent piers.

Figure 5.23. The vocabulary of the exterior circulation is similar to that of the bulkhead and pier in the foreground. Notice the use of the repetitive vertical elements that compose the façade. The building accepts the context within it sits.

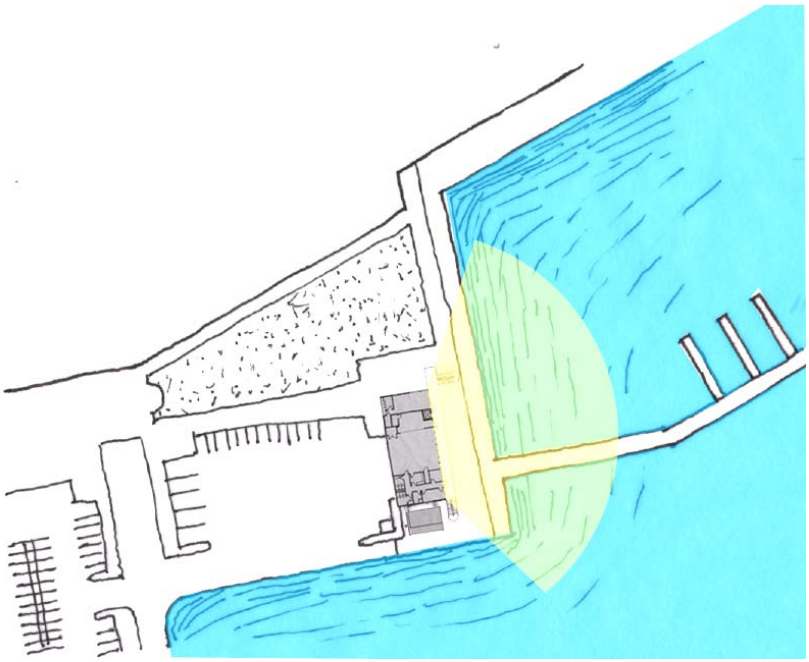

Figure 5.24. The orientation of the building with its broadside to the water allows for a panoramic view of the water.

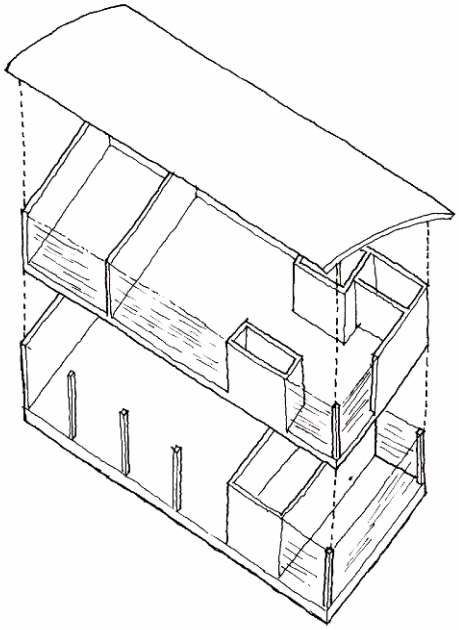

Figure 5.25. This diagram shows the simplicity of the building tectonics. The ground floor features a large workroom for fish packing and sorting, a large refrigerator, and a retail space for selling the fish. The second story features another retail space, a meeting room and some administrative offices for the management of the adjacent marina.

Endangered Garden, San Francisco, California

Figure 5.26. The Endangered Garden is positioned adjacent to the San Francisco Bay.

Patricia Johanson has dedicated over three decades of her life to designing functioning works of art. Johanson's art creates infrastructures that reclaim damaged ecosystems. In her plan of the Endangered Garden in San Francisco, Johanson applied these goals towards the design of a pump station and holding tank for water and sewage.

Endangered Garden was a linear park along the San Francisco Bay commissioned in 1987 by the San Francisco Arts Commission. Johanson designed the park in the shape of a thirty foot wide, one-third of a mile long San Francisco Garter Snake. The snake serves as a tidal sculpture, butterfly meadow, habitat

restoration, seating and overlook and coincides with the roof of the transport/storage sewer. "Ribbon Worm-Tide Pools", a small sculpture within the body of the snake, provides a path down to the marsh and mudflats of San Francisco Bay.(fig 5.27) Depressions in the pavement, modeled on California Indian petroglyphs, fill with rainwater for birds.(fig. 5.28) Johanson was successful in representing the functional structure as a work of art and a productive landscape. "The garden proposes a new aesthetic for designers: to envision solutions that are as creative, functional, and biologically productive as nature herself."[31]

Figure 5.27. At high tide the sculptural tidal pools fill with water, creating habitat for vertically zoned inter-tidal communities. The pools have become a living sculpture—simultaneously aesthetic, functional, and nurturing.

Figure 5.28. Depressions in the pavement, modeled on California Indian petroglyphs, fill with rainwater for birds.[32]

Figure 5.29. Johanson cleverly integrates seating areas into the path in a sculptural way.

I am particularly intrigued by the way Johanson integrates different events and moments into her waterfront promenade. She also makes a strong attempt to create areas where the separation between the built and natural environment are blurred allowing for a greater connection to be made.

Waterfront Promenade in the Southwest Waterfront Plan

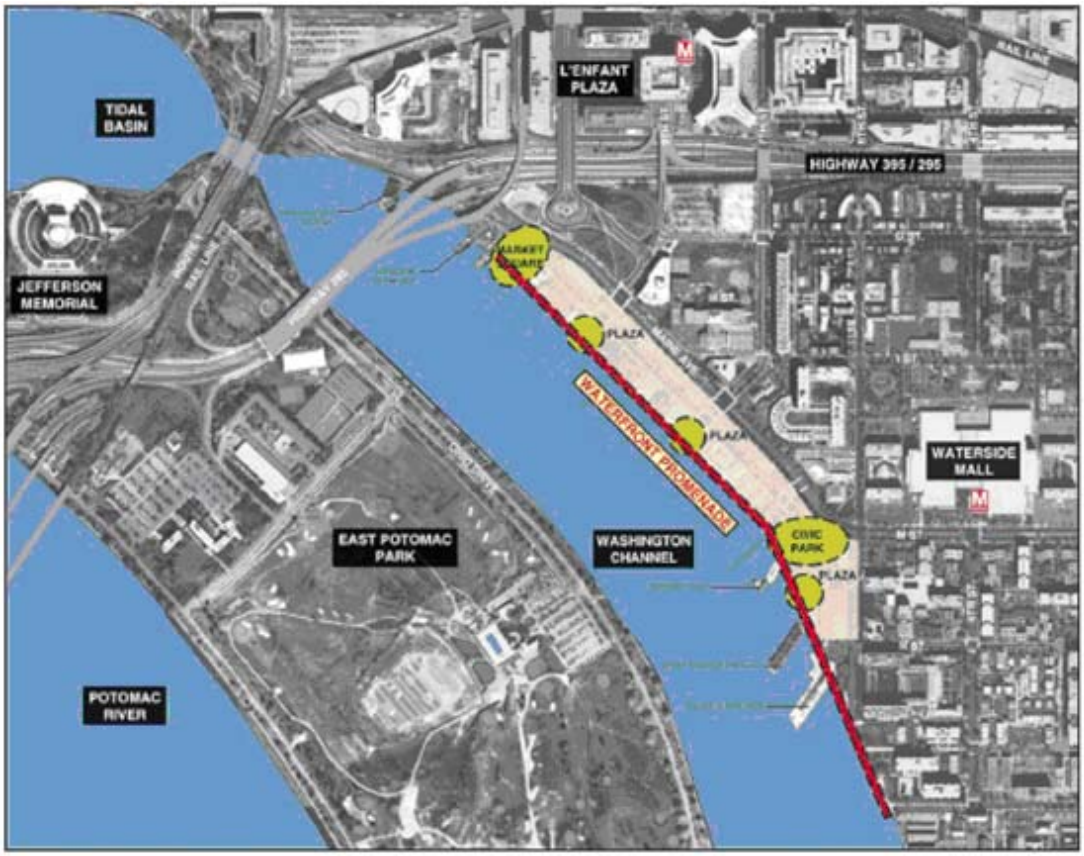

Figure 5.30.[33] This site plan shows the planned areas for the new waterfront promenade under the Southwest Redevelopment Plan, which is part of the Anacostia Waterfront Initiative.

This precedent is particularly useful because it represents two possible solutions to the existing Southwest waterfront promenade. One of the major problems with the promenade is its harsh cross-section which features a two-tiered walkway with a 6 height difference between the two levels. (fig 5.31.)

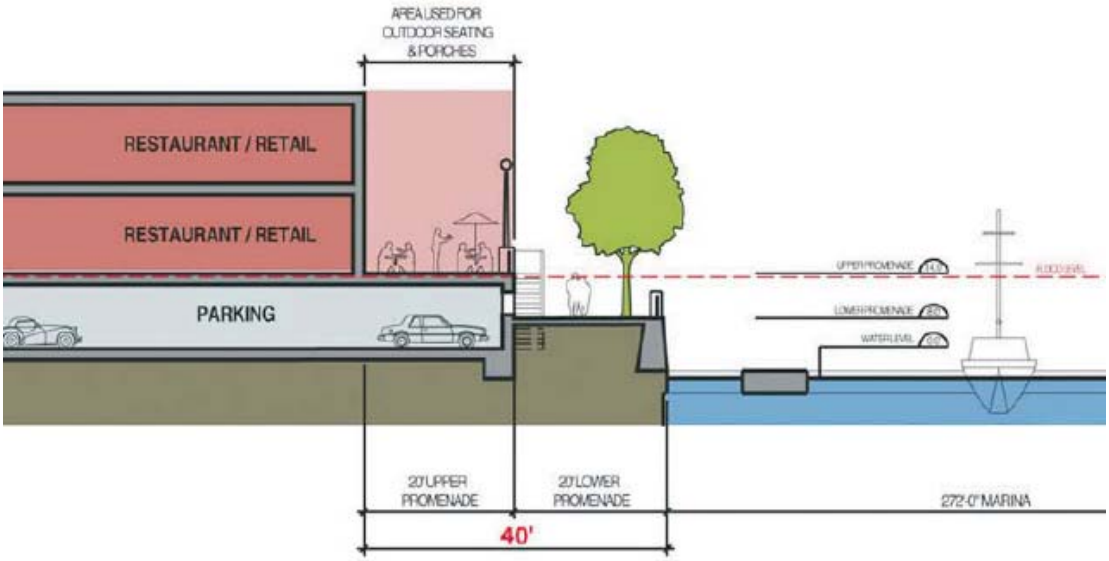

Figure 5.31.[34] The cross-section of the existing promenade features a 6 foot grade change between the two 20' wide levels, which limits access to the water. The two-tiered design also limits sightlines between levels.

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The AWI features the following options for the new waterfront promenade. (fig 5.32-33)

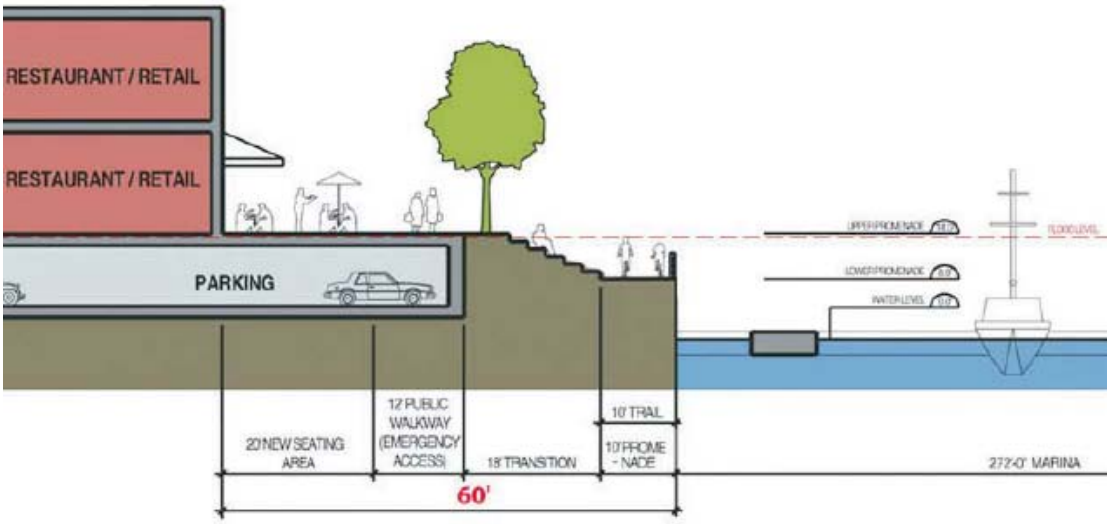

Figure 5.32.[35] Option one for the promenade pulls the buildings back to allow for a 60' width between building face and bulkhead. The grade change is gradually accepted in a green space sandwiched between the upper and lower walkways. This solution is successful in mediating the topographic changes however the 60' set back may not be necessary. I think it would be appropriate for some buildings to sit closer to the water and some buildings such as a civic building may even begin to engage the water.

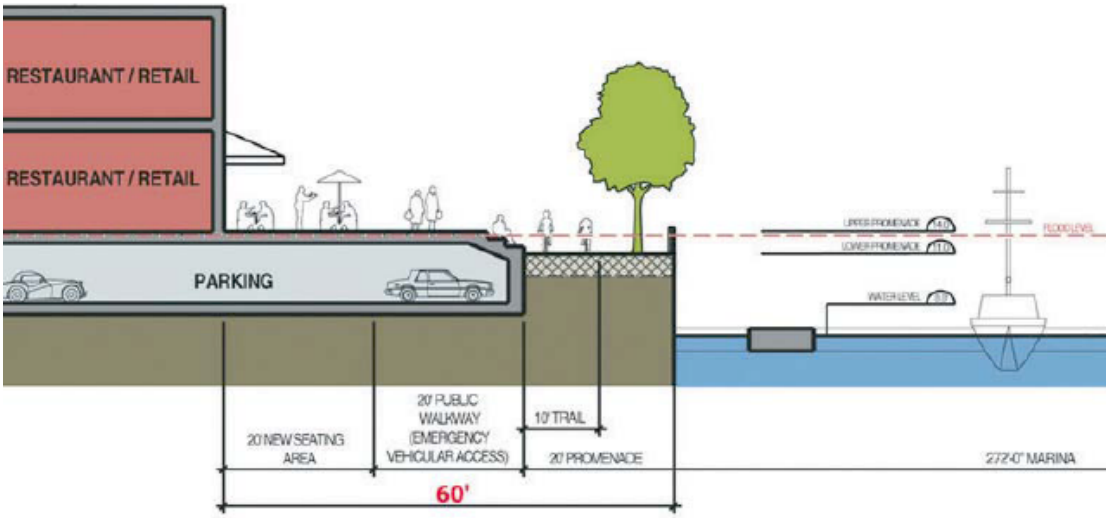

Figure 5.33.[36] Option two raises the lower level by 3 feet, which decrease the height difference between the upper and lower level. This solution is successful in mediating the separation between the two levels; however, it furthers the separation between the patron and the water. Ultimately this solution would be a mistake for a plan, which hopes to capitalize on the waterfront amenity.

South Cove, Battery Park City, New York, New York

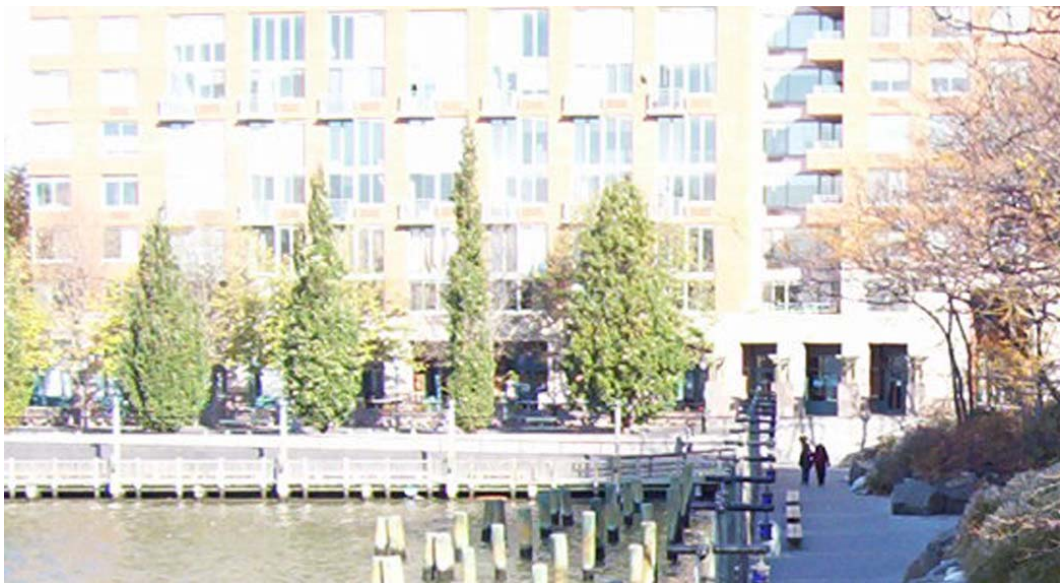

Figure 5.34. The walkway along the north edge offers the pedestrians an opportunity to make a stronger connection to the water. During high tides or storms the water level actually rises above the plane of the walkway.

At the southern end of Battery Park City is South Cove designed by public artist Mary Miss. The site was a 360-foot long cove that was unoccupied since its beginning when it was created by the landfill of the World Trade Center excavations. As pedestrians enter the cove from the North, the walkway separates into an upper and lower path. The northern edge of the cove has an attached wooden walkway that brings the pedestrian lower and closer to the water (fig. 5.34). At the Southern End of the coves Miss removed earth to reveal the platform substructure of the landfill. In this area the walkway extends over the water as a "curved hybrid of pier and loggia with benches added as points of respite (fig. 5.36)."

Figure 5.35. The section of the promenade creates an intimate spatial feeling due to the heavy foliage between the paths and the large canopies of trees above. The character of the paths are different as the upper path exhibits a more private character, while the lower path is more of a public path.

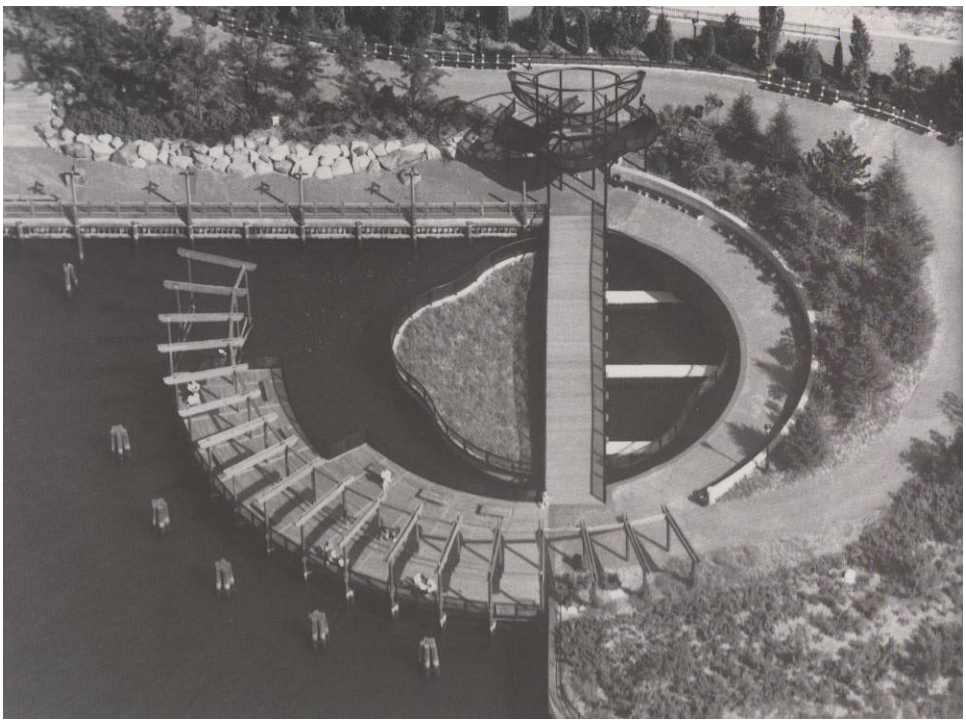

Figure 5.36. It seems that Miss is attempting to blur that boundaries between man-made and the natural. At various points along the cove the pedestrian finds themselves surrounded by the natural elements. However, there are areas such as the center portion of this image where the natural vs. man-made elements are reversed.

Site Opportunities

Figure 6.0. Positano, Italy

The new waterfront promenade coupled with the civic piazza offer the opportunity to improve on several of Southwest's current physical deficiencies. The awkward section of the existing promenade is an opportunity to create a unique system of paths along the waterfront.

Figure 6.1. The existing waterfront buildings rest above a deck of parking that is necessary for floodplain reasons. Due to the 6 foot change in elevation, the promenade features a series of stairs and ramps; however, connection is still limited and sightlines are blurred.

Figure 6.2. The promenade at South Cove uses a two tiered path system that is very similar to the scale and circumstance of the promenade in Southwest. The difference is that South Cove uses the

grade change to create unique spaces that provide intimate spaces and enclosure, while also preserving sight lines.

The new promenade also yields the opportunity to improve upon the recreational limitations of the current promenade.

Figure 6.3. After observing the activities of children in the area it is obvious that there are not enough recreational opportunities along the waterfront. The children in the photograph above are using a shopping cart as a toy and screaming obscenities at the large cruise ship passing by. It seems that there is hostility between the young children and the users of the Washington Channel. It is unfortunate that the waterfront is not more accessible to the children of the neighborhood.

Figure 6.4. The Fair Park Lagoon in Dallas Texas was an environmentally degraded, five-block body of water surrounded by museums that people had to walk around to get from one side to the other. The following quote by Johansan describes the state of the lagoon. "The shoreline was eroding, and the water was murky. The Parks Department had been fertilizing the lawn, and every time it rained fertilizer would wash into the lagoon, causing algal bloom. A green slime covered the water. There was no food chain; there were hardly any plants, animals, or fish. Basically the lagoon was dead." There was also no human interaction with the lagoon as it had become a danger and an obstruction.

Johansan was concerned with creating a functioning ecosystem with a wide variety of native plants and animals, controlling bank erosion and creating paths so that people could access and cross the lagoon. Johansan created a series of sculptures that were modeled after native ferns and served as five-food wide paths that people could walk out on. Smaller portions of the ferns rose out of the water and became habitat for birds and marine life. The Fair Park Lagoon exceeded all of Johansan's initial concerns. "Creating a nurturing, living world doesn't mean it can't be a popular and entertaining place. People love Fair Park Lagoon. Children play alongside the insects, reptiles, birds and mammals that live there. Fair Park Lagoon is really a swamp -- a raw functioning ecology that people are normally afraid of. The art project affords people access to this environment, so they find out how wonderful a swamp really is. It's popular, not because people are overwhelmed by my sculpture. They're discovering a marvelous new world."[37]

The creation of a civic piazza provides the opportunity to provide a quality public space along the waterfront. Currently the amount and quality of public spaces along the Southwest Waterfront is inadequate. There are open spaces along the waterfront; however, they are often poorly designed and covered by an excessive amount of impervious surface (fig. 6.5-6.6). The few piazzas along the waterfront suffer from low pedestrian activity, which is a result of the lack of active destination

spots along the waterfront. The high amount of paved surface along the waterfront ultimately results in the acceleration of storm-water run-off and increased pollution of the Potomac.

The creation of a sustainable civic piazza will actively address the shortcomings of the current situation. The piazza will be activated by the visitors of the museum, inhabitants of the new waterfront development, and the current neighborhood. Applying principles of sustainability and low impact development (LID) in order to manage the quantity and quality of storm water runoff will improve water quality.

Figures 6.5 and 6.6. There is an excessive amount of paving along the waterfront in the form of unused plazas and on grade parking. Notice the absence of any sort of human presence in the photos.

Figure 6.7. The piazza's surface could be constructed with porous pavers. Porous pavers are installed over a gravel base course that provides storage as runoff infiltrates through the porous paver system into underlying permeable soils. Slowing and controlling storm-water runoff the pavers would ultimately lower water pollution of the Washington Channel.

Figure 6.8. Piazza San Marco in Venice exhibits the powerful potential of a waterfront piazza.

Parti Studies

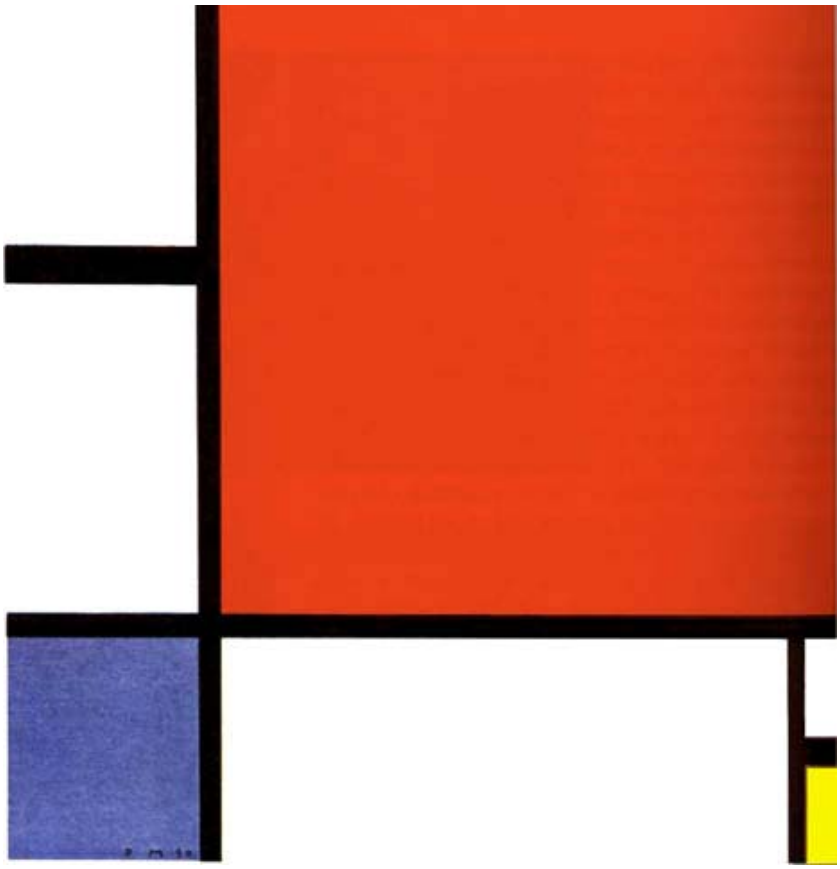

Figure 7.0. Composition with Red, Blue and Yellow, Piet Mondrian, 1930

Parti One

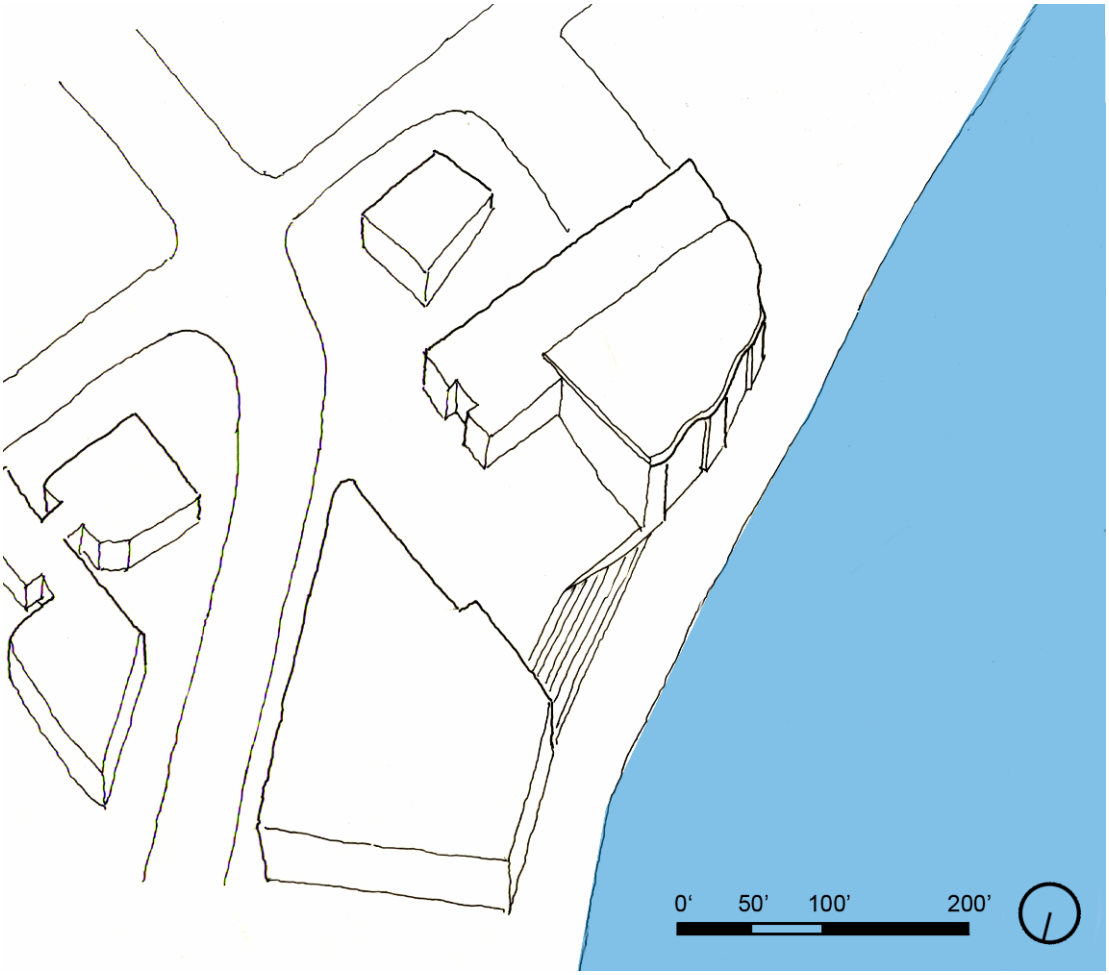

Figure 7.1 The two-part massing of the building distinguishes exhibit space from service space through a hierarchal roof, which uses the motion of waves as a form generator.

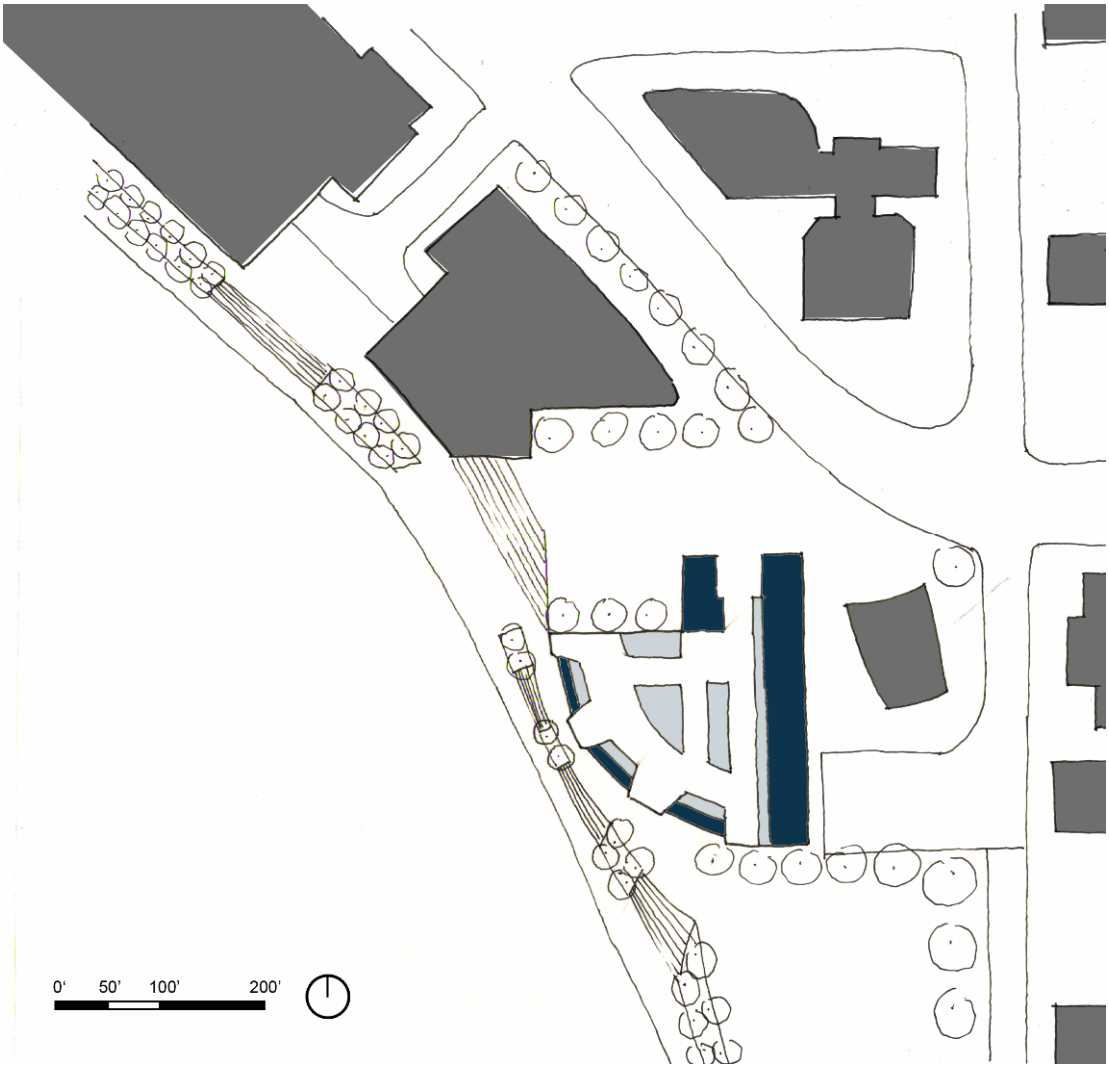

Figure 7.2 This parti is inspired by the fan parti utilized by Alvar Aalto on numerous projects such as the Seinajoki Library. All non exhibit functions are packed into a bar of poche along the east wall. The fan form, which receives maximum exposure to the Washington Channel, is utilized for exhibit space. The serrated edge of the plan is designed to maximize perimeter exposure to the channel. This is a style similar to that used at the Monterey Bay Aquarium. This scheme proposes that the dual program of the maritime aquarium can co-exist within one great space.

Parti Two

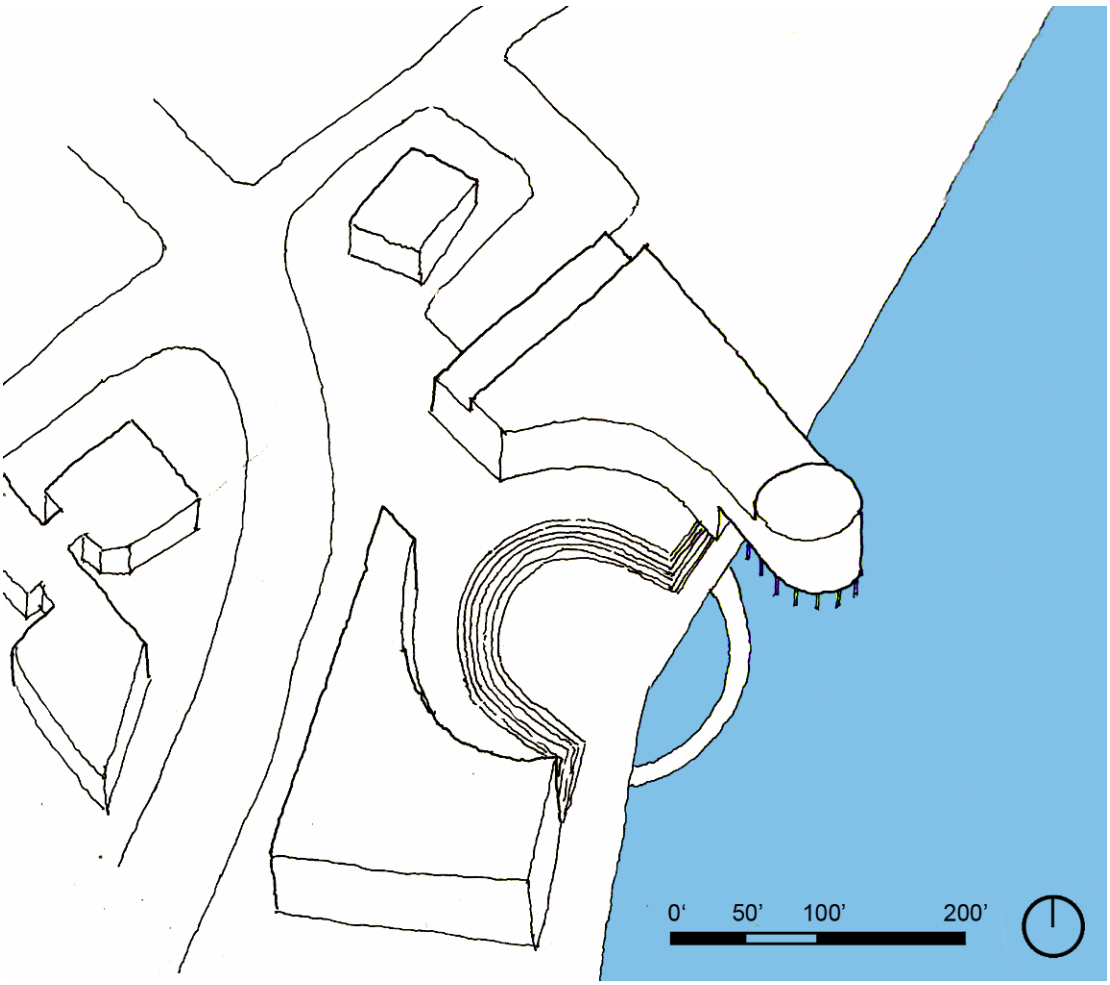

Figure 7.3 Similar to parti one, the exhibit space distinguishes itself from the service space by extruding its height above the level of the service height. The hierarchal form found at the end of the projection suggests that a major exhibit exists within.

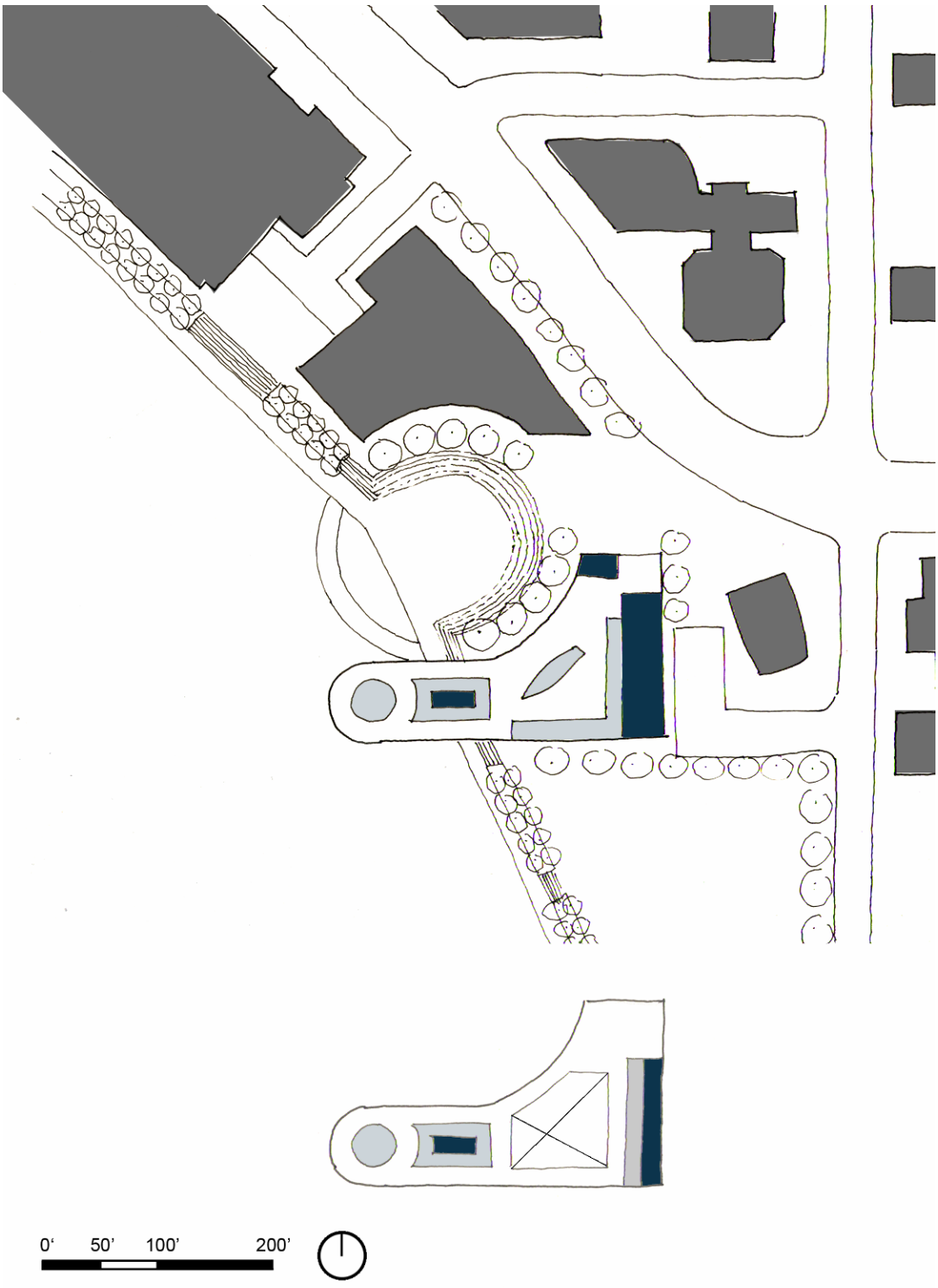

Figure 7.4. This scheme is driven by the form of the exterior piazza. The building extends into the channel organizing the exhibits in a linear fashion. The scheme locates a hierarchal exhibit at the tip of the projection. The building footprint creates a southern bookend for the new development as it “catches the axis.” However, this is also a shortcoming as the building turns its back on the southern end of the promenade.

Parti Three

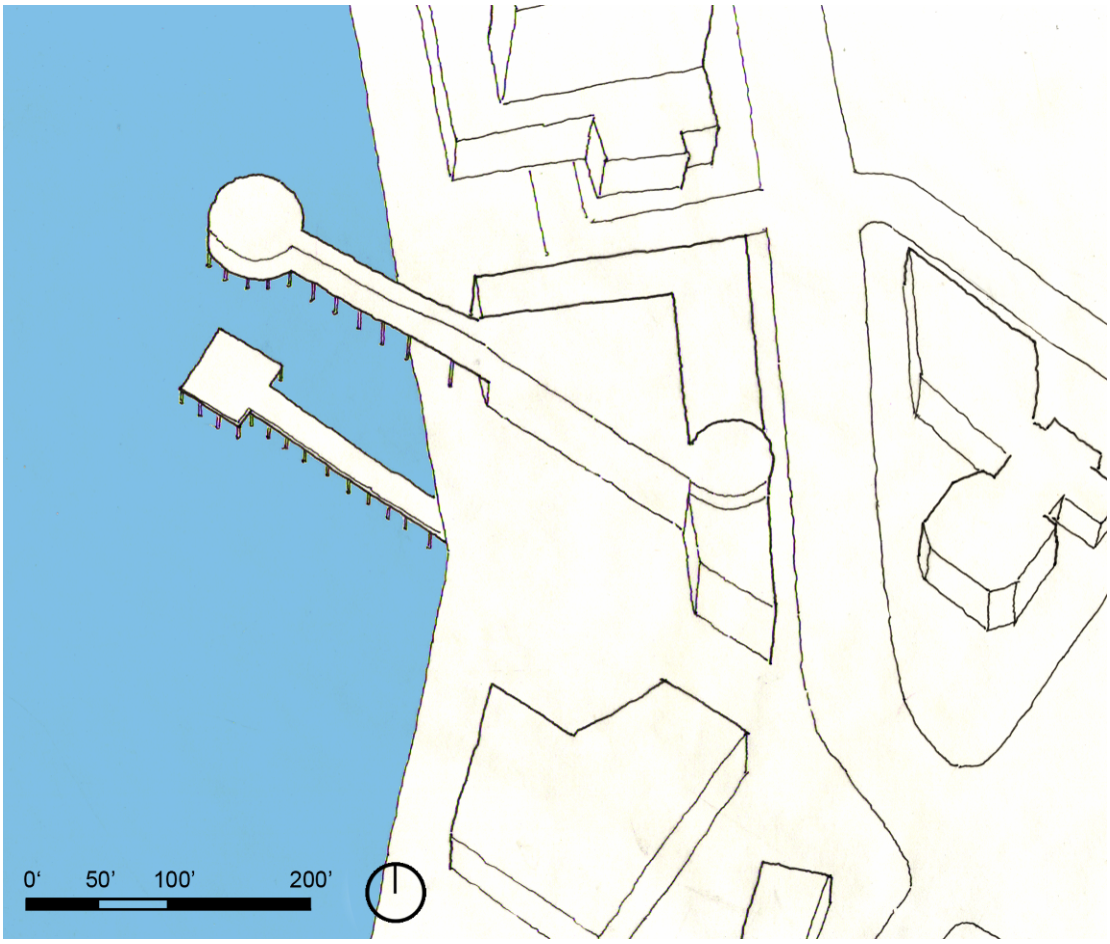

Figure 7.5. This is the only scheme situated on the northern site, which features a shape of land that has some awkward geometry. This scheme extends one exhibit far into the water and also includes a public pier.

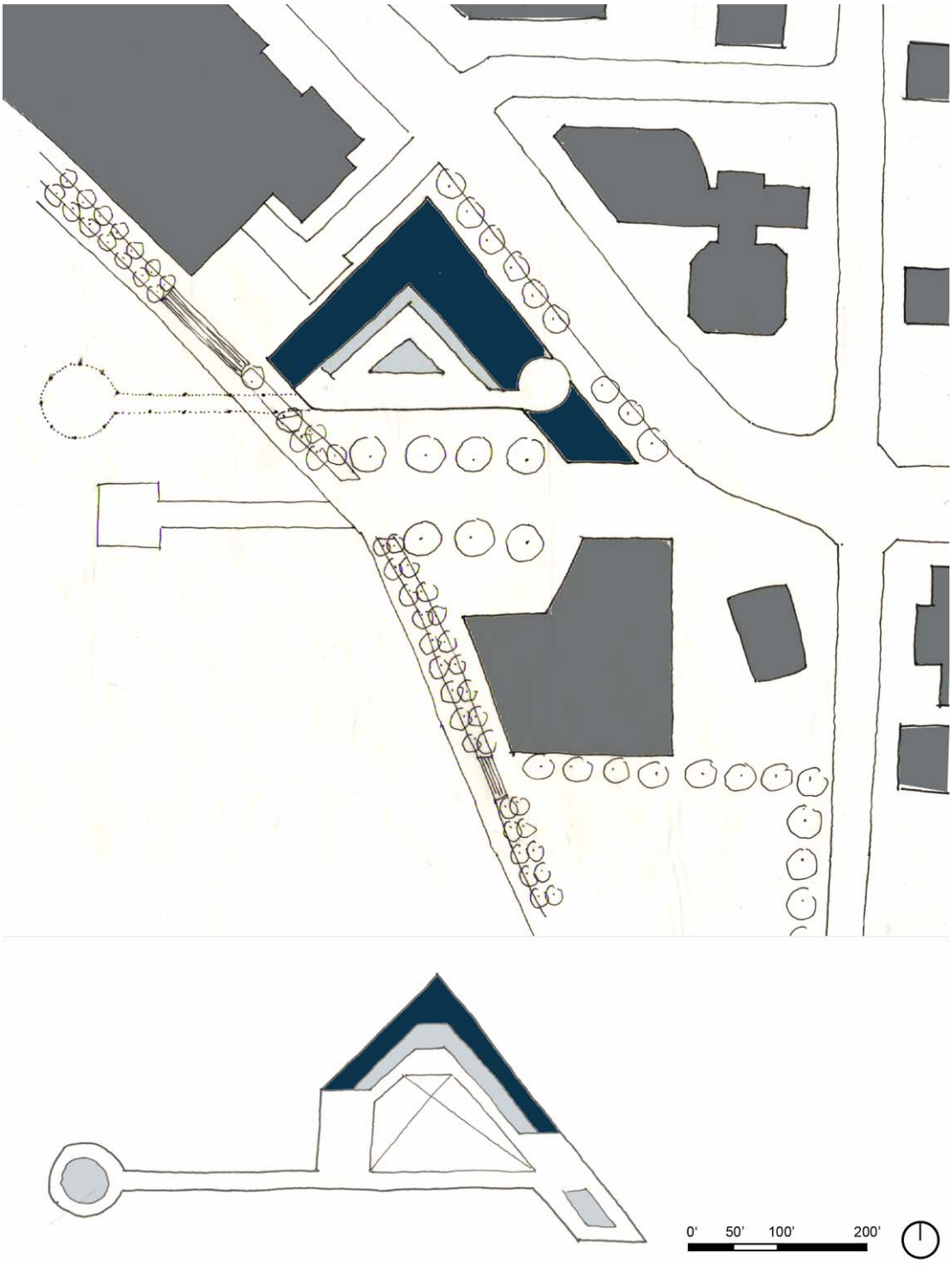

Figure 7.6. Plans

Parti 3 utilizes a bar of poche that wraps the eastern and northern boundaries of the site. The maritime exhibits would be located on the 1st floor and the aquarium exhibits would be located on the 2nd floor. This scheme is the most aggressive at reinforcing circulation routes.

Design Conclusions

Figure 8.00. Aquarium Section

Site Plan

The major elements of the site plan include 4 buildings as well as a public pier and several public spaces. The largest open space created was the waterfront piazza parallel to Maine Avenue. The linear space is flanked to the north by a 7-story mixed-use building with cafes and retail on the ground floor and to the south by a small cove (fig. 8.1). The cove was created by an adjustment to the bulk-head which made a body of water adequate for small watercraft such as kayaks, canoes and paddle boats. The coves north-west edge is created by a public pier, which features a multi-tiered section making it conducive to a variety of recreational activities. The southern edge of the cove is created by the Maritime Aquarium which is a linear building that begins at the intersection of M and 4th streets and stretches out into the channel. Located south of the Maritime Aquarium are two 6-story courtyard style residential buildings.

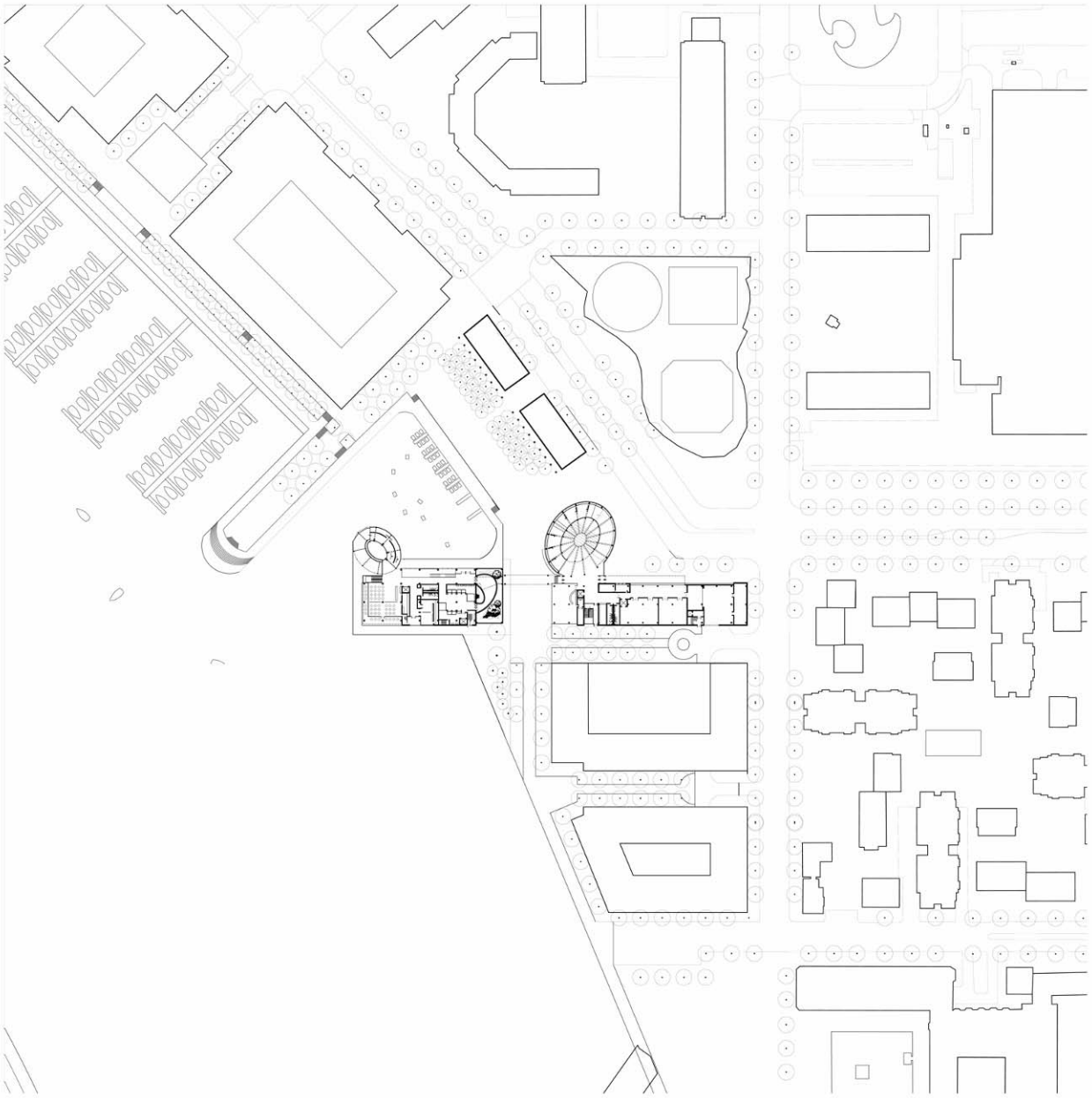

Figure 8.0. Site Plan

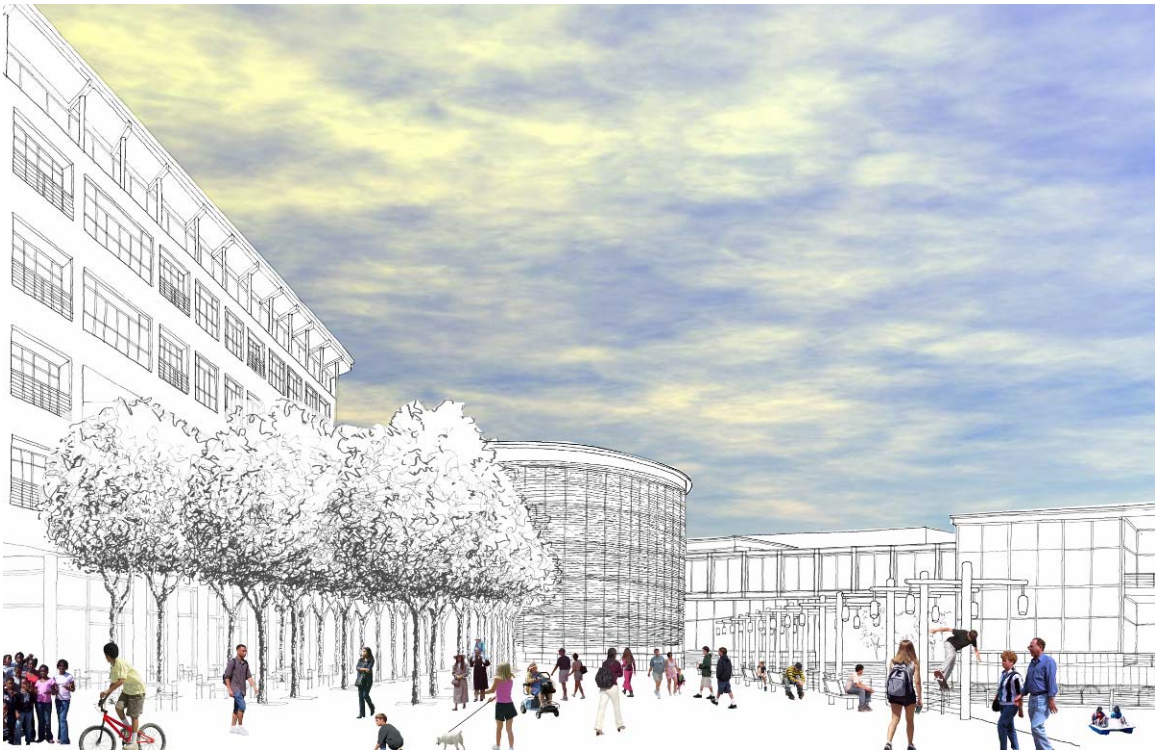

Figure 8.1. The waterfront piazza would be activated by a variety of visitors including patrons of the museum and nearby retail as well as pedestrians promenading along the waterfront.

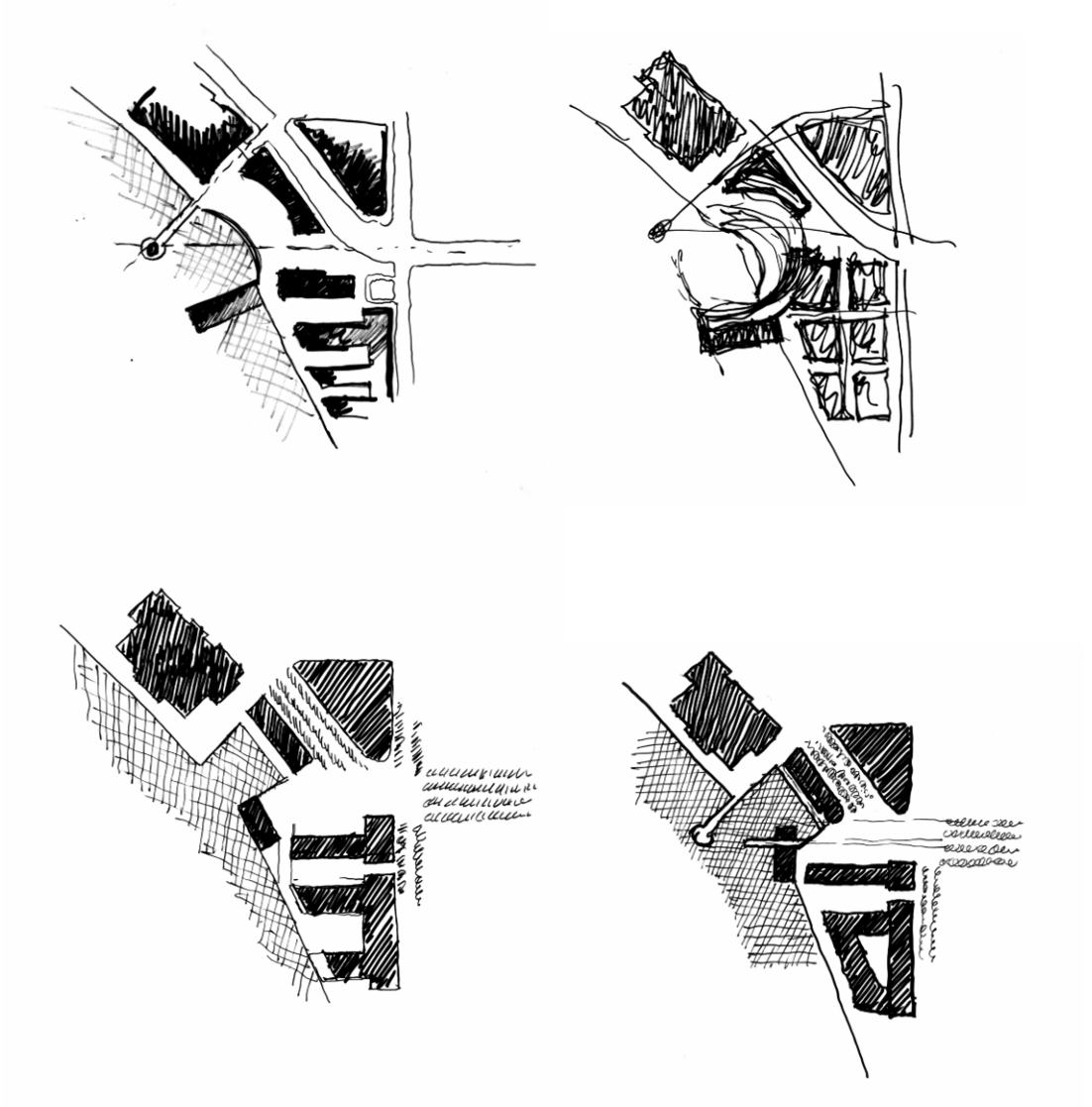

Figure 8.2. These process sketches show different space-making strategies.

The DC Maritime Aquarium

One of the major concerns with the design of the Maritime Aquarium was the circulation. The goal was to create circulation path that was simple but dynamic in that it presented the visitors with a variety of different environments. The following sequence outlines the optimal procession through the DC Maritime Aquarium.

The journey building begins on the exterior of the building where the ticket purchasing and queuing area are located. In the event of a long wait in line there is an awning parallel to the building as well as an 80 foot long aquarium imbedded in the wall (fig. 8.5). The entrance to the building occurs in the glazed slot that mediates between the elliptical pieces and the bar buildings.

Upon entry the visitor encounters the grand atrium space that functions as the maritime exhibit hall as well as a public gathering space. The elliptical space is of grand proportions with dimensions of 80ft. x 120ft. and a ceiling height of 55 ft. Wrapping the exterior of the space is a gently sloping ramp that provides access to the second floor of the building as well as holding several small maritime exhibits (fig. 8.6). The floor which emulates the auditorium buried below, gradually steps up providing the opportunity for the display of certain exhibits.

After ascending the ramp to the second floor visitors have the opportunity to pass across the 80ft. long glass bridge that connects the entry building to the aquarium building. Upon entry to the aquarium building visitors pass through the Salt Marsh Aviary (fig 8.7). Visitors are above the exhibit area which is located 22ft below.

The aquarium building is a 2 story building with a basement that is linked together by a 3-story space on the northern wall. The second floor of the building holds the Southeastern Plains Gallery, the Chesapeake Bay Gallery and the Children's Exhibit. The two gallery spaces are primarily black-box environments that feature several small aquariums that are engaged within the perimeter walls. The Children's Exhibit is a naturally lit exhibit that features several smaller installations including the touch tank (fig 8.9).

Visitors traveling to the 1st floor have the opportunity to take the stairs or use the Chesapeake Bay shark exhibit to descend. The shark tank is located within the second ellipse. This exhibit features a 24,000 gallon tank that is wrapped with two movement systems (fig. 8.10). The interior path is a black-box environment that puts the visitors in close contact with the tank. The exterior path allows visitors to view the Washington Channel. At the 4 focal points of the ellipse visitors have the opportunity to change between the interior and exterior paths. The shark exhibit makes two revolutions between the 2nd and 1st floor.

The first floor of the aquarium holds several of the supporting functions as well as the Coastal Plain's exhibits. Visitors have the opportunity to dine in the Café or Restaurant which are located on the Southwest corner of the aquarium. The first floor also holds the aquarium's wet labs and classrooms. The Eastern end of the aquarium holds the Coastal Plain Gallery as well as the Salt Marsh Aviary. The Salt Marsh Aviary is a green-house environment that recreates the habitat of a salt marsh found in the Coastal Plain.

The basement level of the aquarium is 5 feet below the level of the Washington Channel. Floor features 6 foot tall circular portholes that allow the visitors to peer into the Washington Channel. It is at this point that the visitors gain a glimpse of reality as they view the unattractive conditions of the Washington Channel. Through the portholes visitors will see things such as barnacles growing on the dock, trash floating in the water and the occasional fish (fig. 8.12). It is this reality check that is the most important exhibit of the museum. As the visitor moves east along the circulation spine they move from an environment immersed in water to an environment buried in the earth.

The conclusion of the tour includes the ascension of the visitor to the initial point of departure at the atrium space.

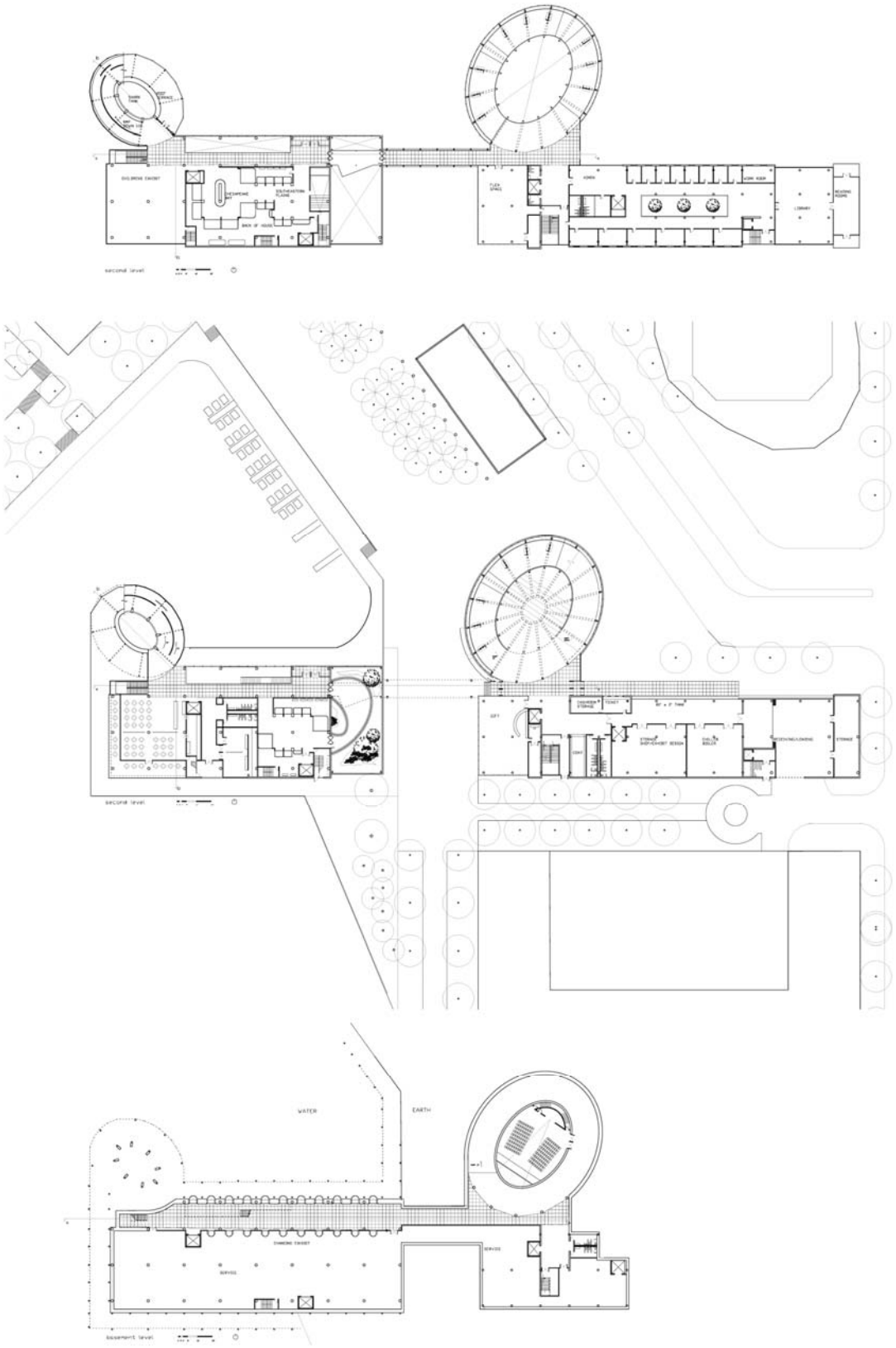

Figure 8.3. 2nd floor plan, ground floor plan, basement floor plan (from top).

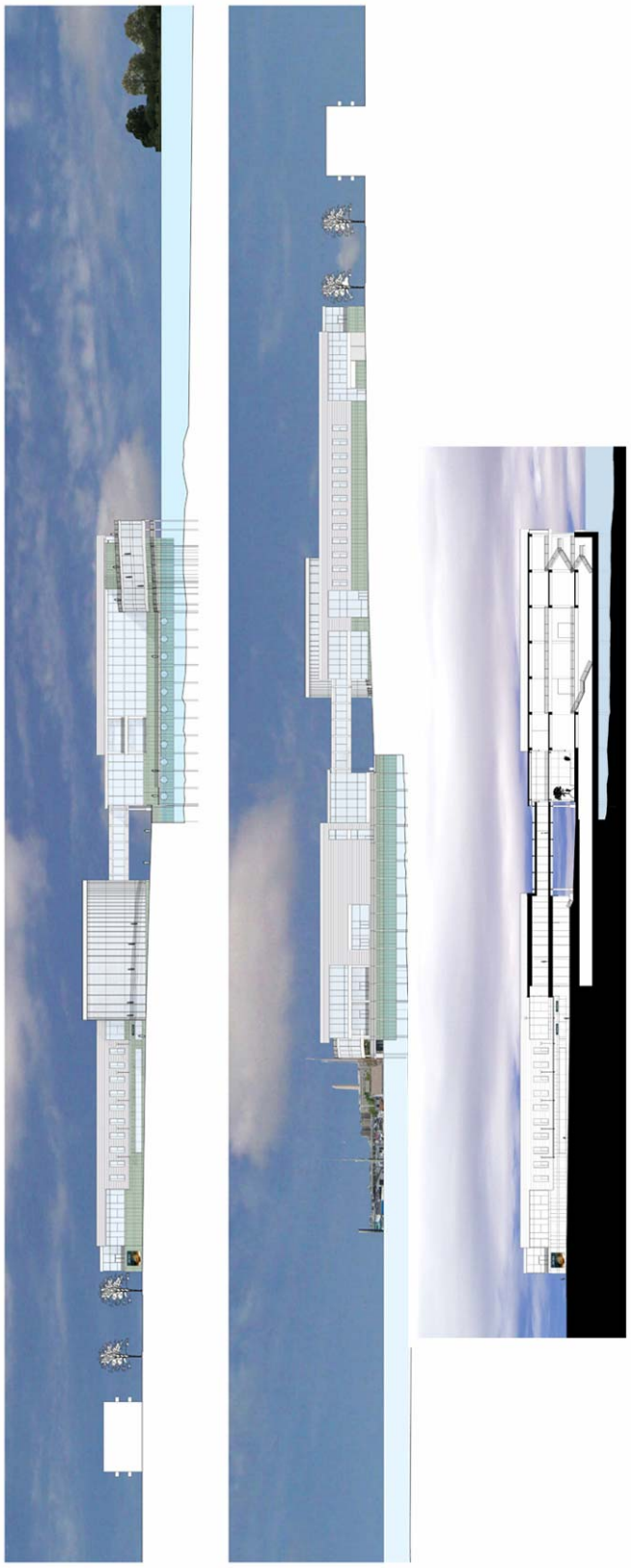

Figure 8.4. North elevation, south elevation, longitudinal section.

Figure 8.5. Entry perspective.

Figure 8.6 Atrium perspective.

Figure 8.7. Salt marsh aviary perspective.

Figure 8.8 Aquarium gallery perspective.

Figure 8.9. Children's exhibit perspective.

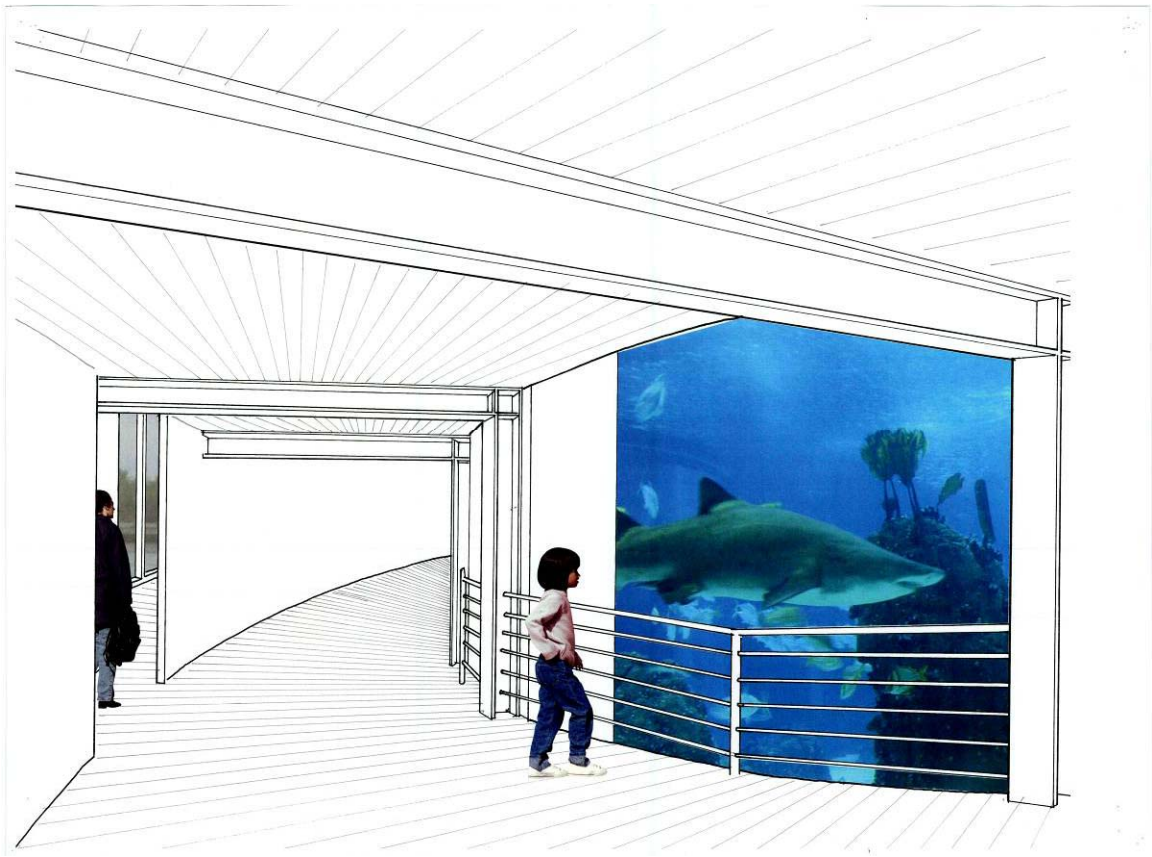

Figure 8.10. Shark tank perspective.

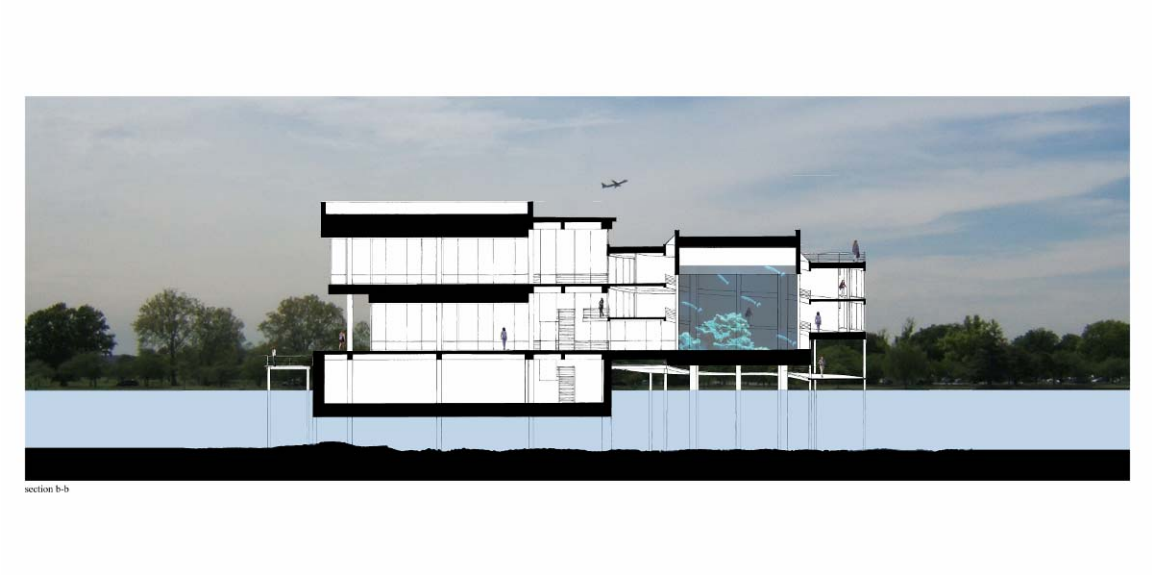

Figure 8.11 Shark tank section.

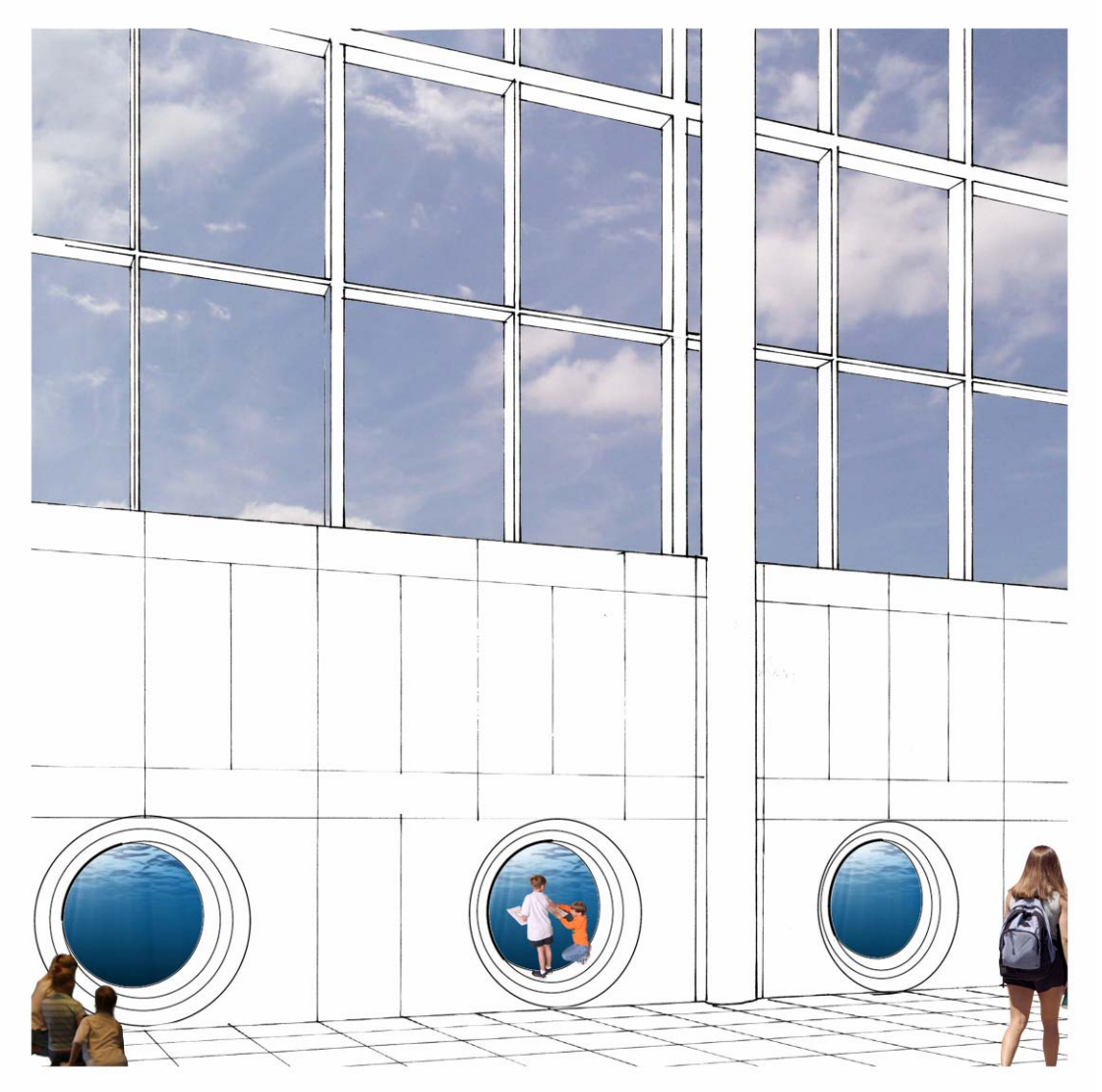

Figure 8.12. Basement perspective.

Process

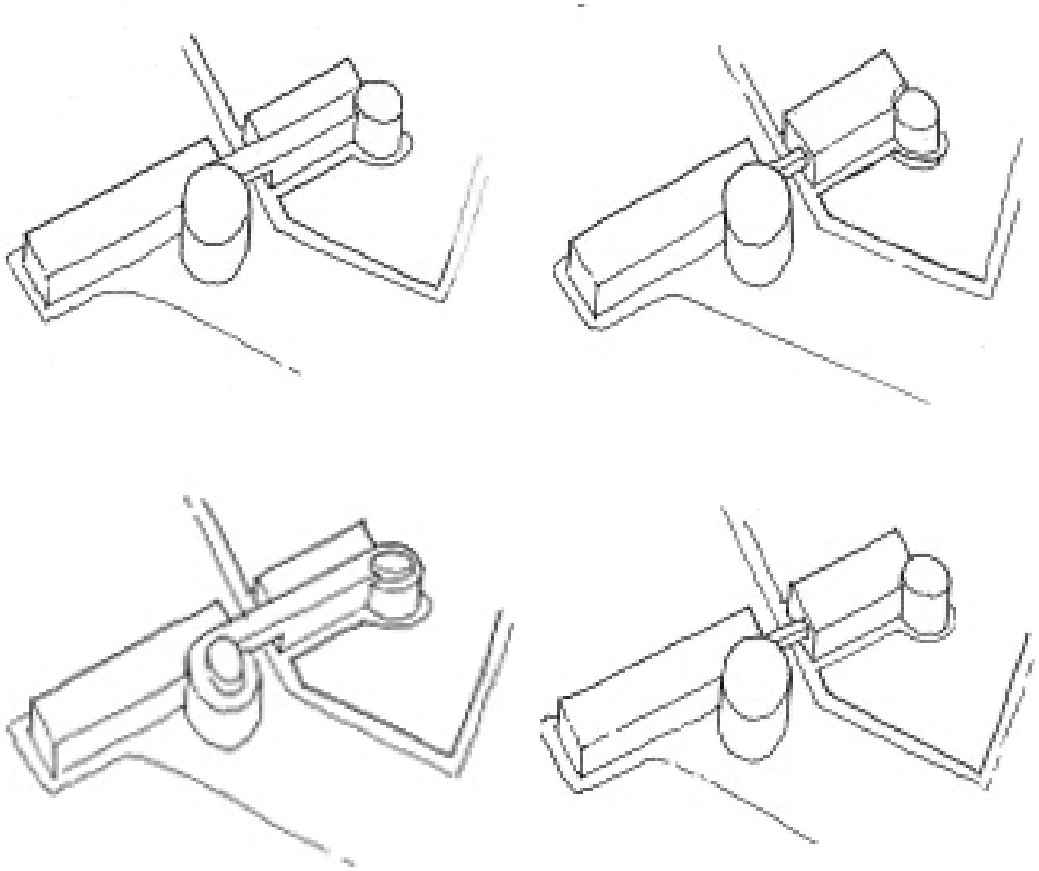

Figure 8.13. Massing studies

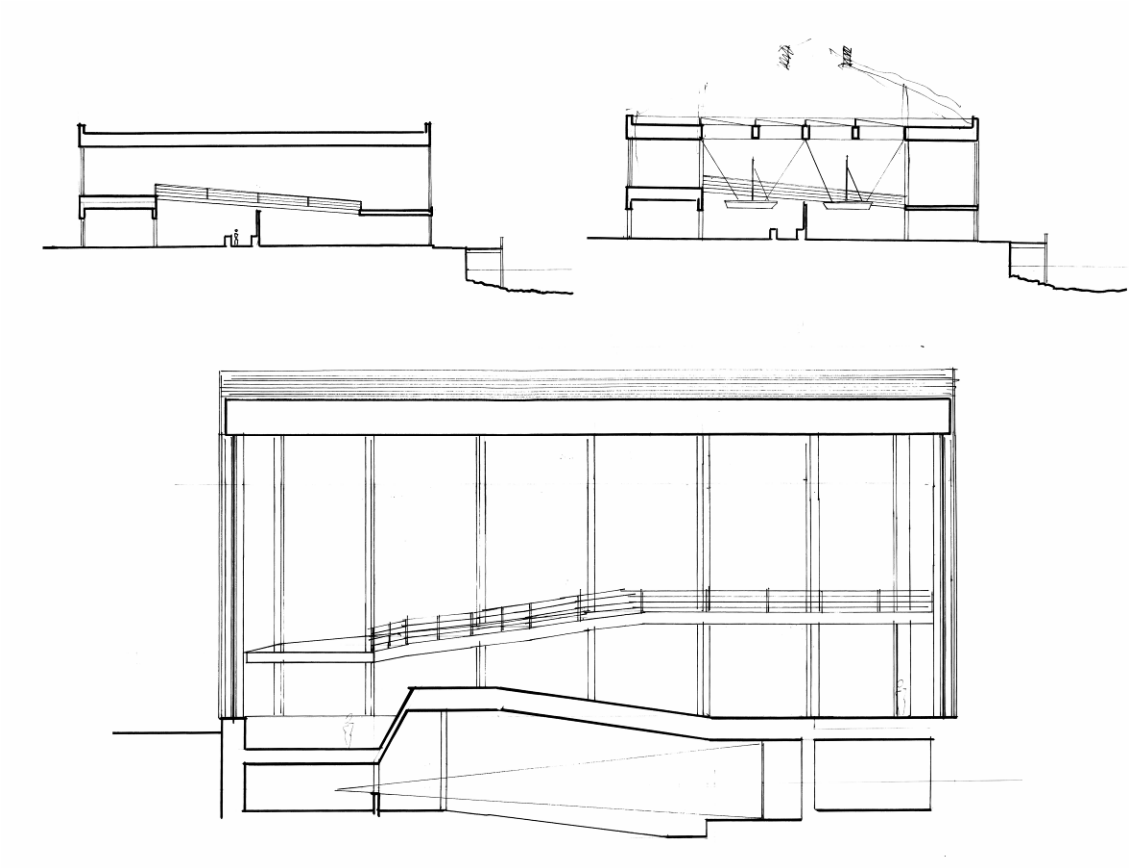

Figure 8.14. These atrium sections show the evolution of the atrium space.

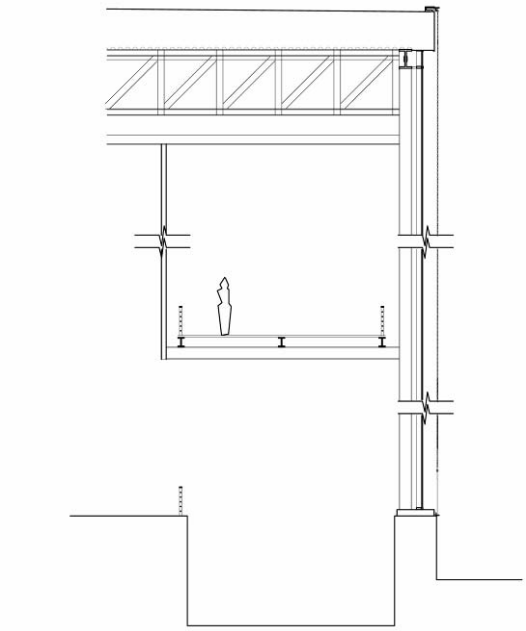

Figure 8.15. This wall section demonstrates the structure of the atrium space.

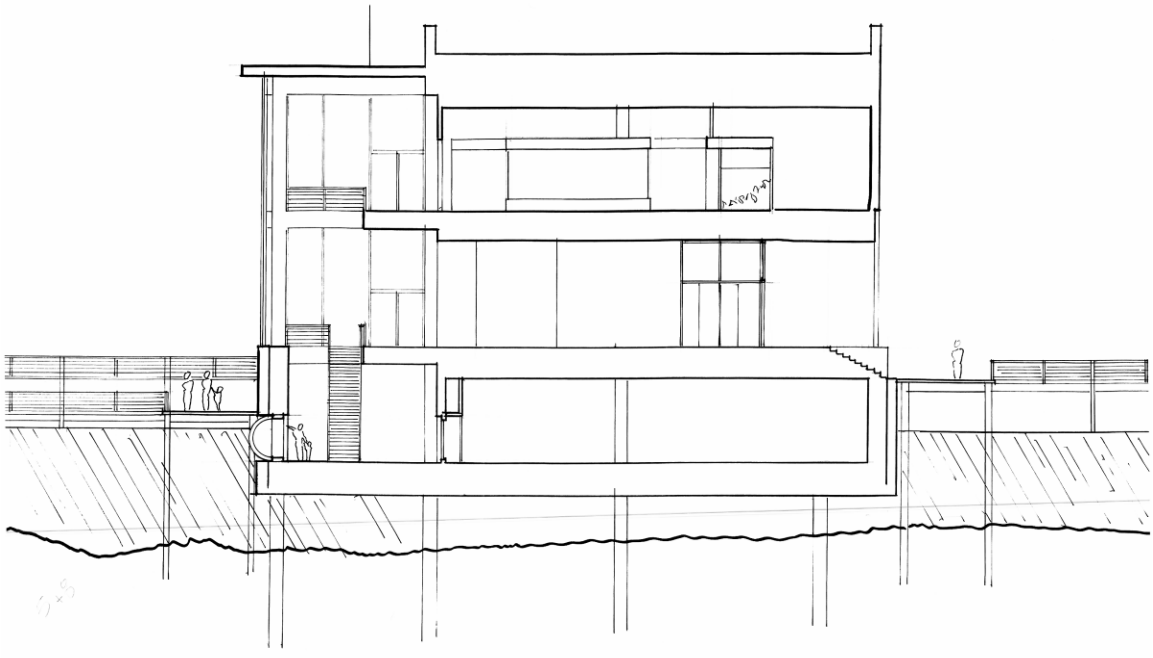

Figure 8.16. This cross-section illustrates the subterranean condition of the basement level.

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